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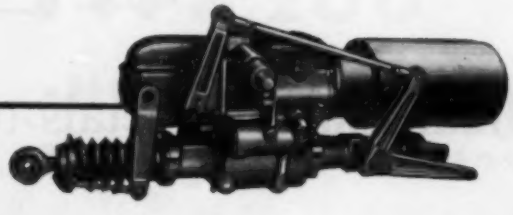

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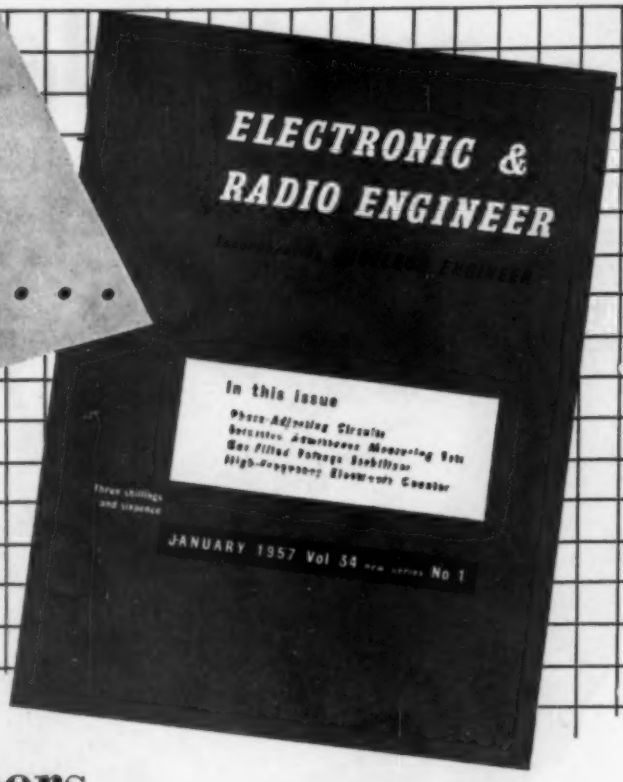

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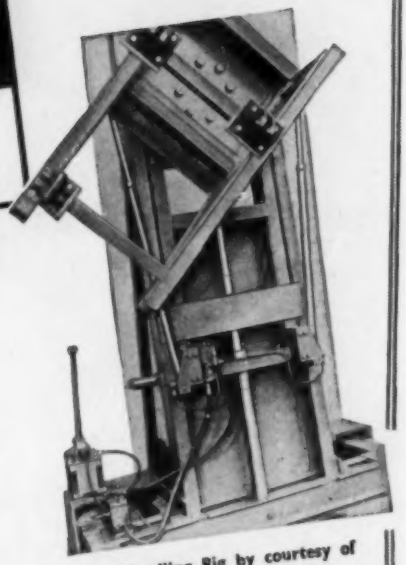

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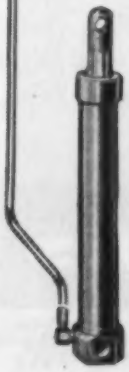

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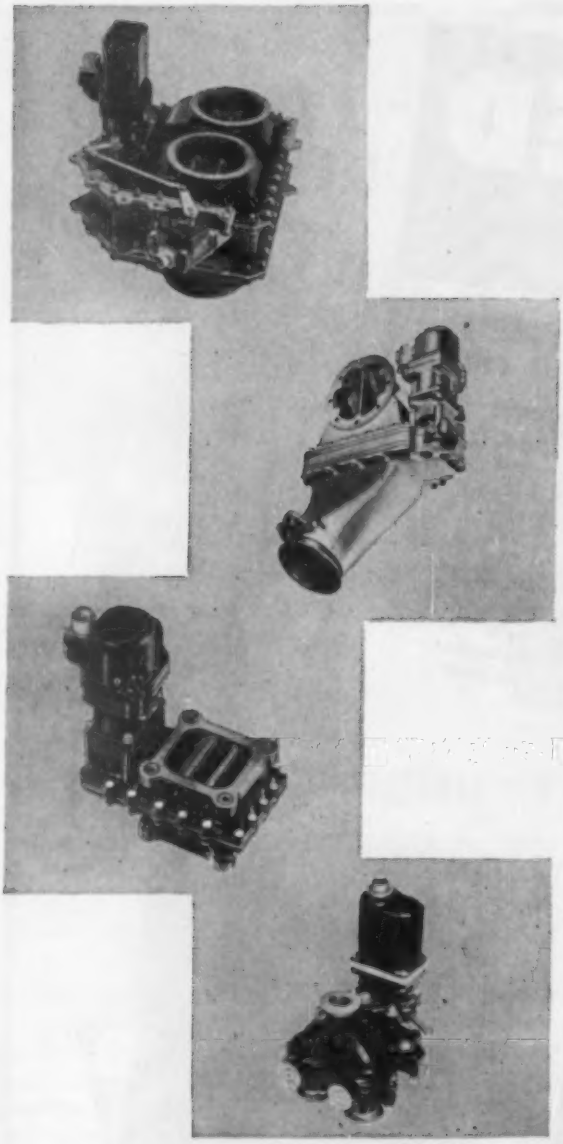

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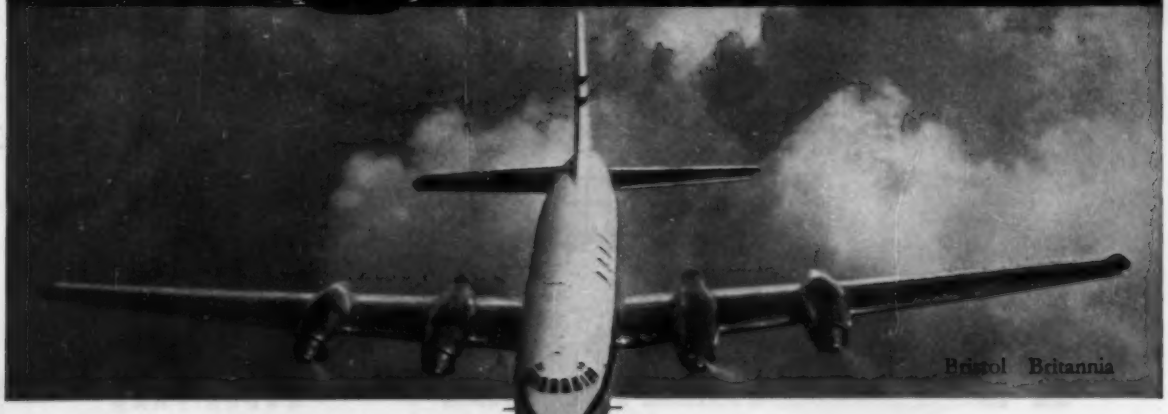

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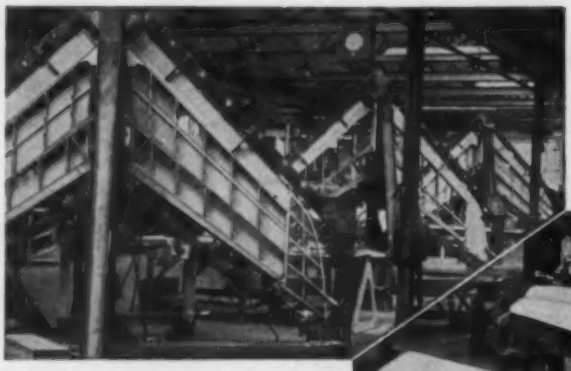

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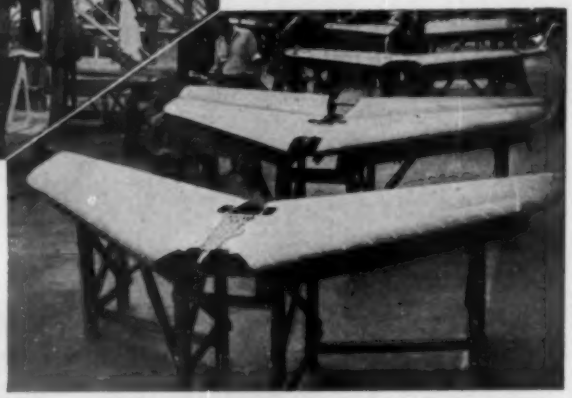

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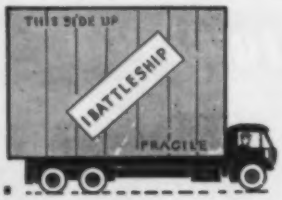

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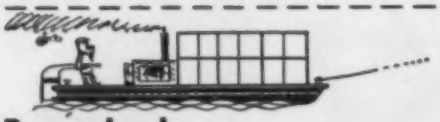

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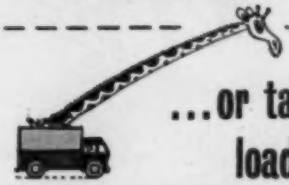

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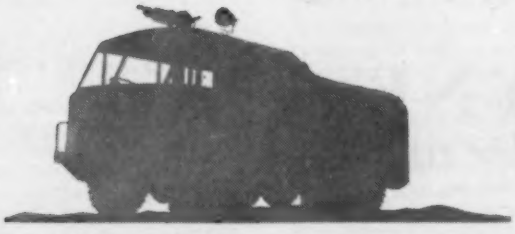

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FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT
and
AIRCRAFT ENGINEER

No 2499 Vol 70 FRIDAY 14 DECEMBER 1956

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Swift Vindication

ONE of the most chastening vicissitudes of British post-war military-aircraft development was the failure of the Supermarine Swift in the rôle of high-altitude intercepter fighter. Parliamentary and public criticism was acrid and unsparing. Governmental regrets were abject and profound. Explanations—at first woolly—became more pointed and painful as the facts were drawn into the light. Truly the intercepter race was not to the Swift.

It would be profitless now to rake further over that sombre affair. We should regard it, if not as a sharp object lesson, then as a salutary shock to the nation's system. More satisfactory still, the outcome is seen to be less lamentable than might once have been feared; for the happy fact is that the Swift, far from having been written off as a dead loss, has proved itself a distinct success—in a secondary, though literally vital, application. We allude, of course, to its proven performance with the German-based fighter/reconnaissance squadrons of 2nd T.A.F.

Reconnaissance, we recall, has been described by the C-in-C. 2nd T.A.F. as being of "supreme importance"; he reasons that it is useless to rely on atomic weapons to win a land battle without adequate and speedy reconnaissance to locate suitable targets. For putting that reasoning into effect the Swift F.R.5 is proving an admirable instrument. At the required high speeds and low levels it is popular with its pilots, for it handles amiably and positively; and by virtue of its afterburner (it is still the only R.A.F. machine to be so equipped), it has an excellent acceleration. Internal tankage is greater than that of the Republic Thunderflash, the F.R.5's American counterpart, and the armament of two 30 mm guns is wholly adequate not only for self-defence and the occasional shooting-up of ground targets, but—the opinion is growing—for air-to-air use also.

The number of "F.R." Swifts, of course, falls far below the originally planned quantity of intercepters; but other machines of the type, notably the Fireflash-armed Mk 7, are busily engaged on special trials and research programmes. Thus, a much maligned aeroplane has, to a useful extent, vindicated itself—in part by fortuitous circumstances, but largely by its own merits.

Geographic Intelligence

RECONNAISSANCE of a different kind is a theme of an important contribution on pages 918-919 of this issue. The author, Mr. Guy Mallery, is the advanced design project engineer of the Martin company, of Baltimore—much respected (if lately unfortunate) protagonists of the flying-boat. Mr. Mallery emphasizes that greater strides are needed in the fields of oceanography and geographic intelligence if the military Services are to make efficient use of the coming generation of water-based aircraft, typified by the SeaMaster. Such machines, he points out, are truly weapons systems; but not, he adds, atomic-age weapons systems unless it is possible to predict, select and make use of operating sites in the open seas, in rivers, canals, harbours and sheltered water areas all over the globe. Mr. Mallery demonstrates that, in the static warfare of 1914-18, geography and related intelligence data were mainly concerned with the strategic implications of grand offensives. In World War II, where regional exploitation sweeps took combat troops into enemy territory on their own, the geographer was frequently called upon for tactical considerations as well as for grand strategy. In an atomic war, the need for constant mobility and flexibility will, it is reasoned, make the geographer and his sensitivity for terrain and cultural features a key factor in day-to-day tactical operations.

Mr. Mallery's case is a forceful and urgent one, and it is backed by the firm knowledge that the Martin SeaMaster—notwithstanding the loss of the first two prototypes—has already been ordered into production, and that plans for more than one version exist. Would that Short Brothers and Harland at Belfast, and Saunders-Roe in the Isle of Wight, had a like assurance to help sustain their enduring faith in water-based aircraft.

FROM ALL QUARTERS

IN ARCTIC RIG (1): The essentially fine lines of this Lockheed P2V-7 Neptune for Operation Deep Freeze (see "Flight" of November 30) are noticeably modified by the presence of skis (5ft wide and 16ft long); wing-tip nacelles for carrying fuel, radar and a searchlight; under-wing jet pods; a "stinger" tail; and assorted ventral and dorsal excrescences.

U.S.-Iceland Agreement

ON December 6 the State Department confirmed that the United States and Iceland had reached an agreement which will allow American forces to remain at the Keflavik air base. The two Governments have agreed, stated the department, that "the continuing threat to the security of Iceland and the North Atlantic community" necessitated the retention of forces in Iceland.

Provisions for ending the agreement are unchanged; either Government can seek a review of the situation from the North Atlantic Council, and if it achieves no satisfaction within six months can end the agreement on a further 12 months' notice.

The agreement also calls for increased participation in defence work by Icelandic nationals and the institution of training programmes for them. Construction projects at Keflavik, which were suspended last year, are now expected to be resumed.

Flying Clubs and the Fuel Tax

AS reported in this week's "Club and Gliding News" page, the Royal Aero Club (in addition to the British Gliding Association and the Popular Flying Association) has applied to the Ministry of Transport and Civil Aviation for a further grant in relief of fuel tax. The R.Ae.C. letter of application to the Parliamentary Secretary to the M.T.C.A. indicates that an additional cost of at least 8s 6d per hour on flying charges is probable if the recently announced additional tax has to be paid by clubs, groups and private owners.

At present the clubs and groups (but not private owners) receive a grant in relief of fuel tax which, the Royal Aero Club states, "was granted to offset the last heavy increases in fuel taxation." The Club's application continues: "It is to be hoped that the principle can be extended to cover the additional tax now levied upon private aviation including the remaining private aircraft in this country."

After mentioning the probable additional cost of flying quoted above, the letter continues:

"It is felt that this additional charge at this difficult period when operational private flying will be reduced as a result of petrol rationing for cars, may well have disastrous consequences for the majority of clubs and groups and for owners of private aircraft. May we therefore urge upon you the very great desirability of absorbing the greater part—if not all—of this extra tax increase by raising the present grant in relief of petrol tax to cover the one-shilling-per-gallon additional tax.

"We feel that the small amount of fuel used by the private aviation movement is unlikely to have any real effect upon the economy of the country. While fully appreciating the necessity for a reduction of 25 per cent in supplies, unless some concession can be given we foresee that the extra tax may well result in the unemployment of professional pilot-instructors and the elimination of private aircraft to such an extent that to the rest of the world it will appear this is a country where private aviation is practically extinct; this surely would be detrimental to national prestige."

American Jet Flaps?

SINCE some of the work was disclosed just over a year ago (see *Flight* for September 30, 1955) the jet flap has been intensively studied by every major nation. Several countries, notably France, have conducted parallel work on similar schemes.

Over a month ago the American National Advisory Committee for Aeronautics published results of tests which they had conducted at the Langley Laboratory, with a view to American use of the jet-flap idea. Now, an American company—presumably a firm of aircraft builders—is reported to be wishing to make such systems under licence. The devices relating to jet flaps were developed by the National Gas Turbine Establishment, and the patents are held by Power Jets, Ltd., a company owned by the British Government. The Ministry of Supply state that discussion has not yet reached the "financial stage."

Lockheed U-2: An Eye-opener

DESCRIBING the first—and still exclusive—illustrated description of the Lockheed U-2 (*Flight*, November 23) as an eye-opener to U.S.A.F. personnel, a reader goes on to affirm that the undercarriage is jettisoned after take-off. The gear itself, he says, is not unlike that of the B-47, and for landing the machine makes a normal runway approach, touches down and veers on to the grass, finally dropping on one wing-tip.

It may be recalled that the jettisonable undercarriage feature had previously been reported, but subsequently denied. A feasible explanation is that the gear is retained for training flights and medium-level work, but is dropped to enable the aircraft to attain extreme altitudes on operational missions.

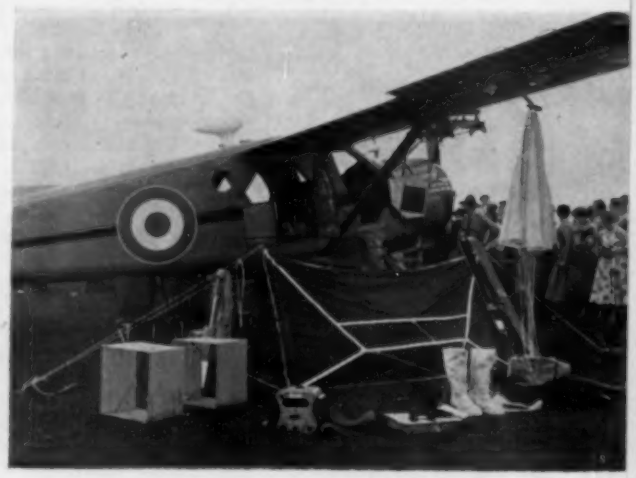
The pilots who fly the U-2s are said to be civilians employed by the All-Weather Service (MATS) of the U.S.A.F. Two machines were originally based at Lakenheath, later moving to Wiesbaden, Germany, where, following an accident to one, the remaining example was seen flying during the week ended December 1. While on the ground U-2s are closely guarded at all times.

Shackleton Accident

WE regret to record the deaths, in a flying accident on December 7, of S/L. J. B. Wales and three technicians of A. V. Roe and Co., Ltd.—G. A. Blake (flight engineer) and C. O'Neill and R. A. Greenhalgh (technical observers). They were on a test flight in a Shackleton from Woodford, Cheshire, when it crashed and caught fire near the Derbyshire village of Foolow.

S/L. Jack Wales, O.B.E., D.F.C., T.D., had been an Avro production test pilot since 1946. He was also commanding officer of No. 613 (City of Manchester) Squadron, R.Aux.A.F. Aged 39, he had joined the Army in 1936 but transferred to the R.A.F. on the outbreak of war and served as a fighter pilot, chiefly in India

IN ARCTIC RIG (2): Ranged before this orange-painted de Havilland Beaver for the New Zealand section of the Trans-Antarctic expedition is some of its special equipment, including a kite for hoisting an aerial, a serviceable tent, camera and special clothing.



SUFFIX "A", appended to the type-designation P.1, distinguishes this Armstrong Siddeley Sapphire-powered prototype of English Electric's supersonic intercepter from the production-type Rolls-Royce Avon-engined P.1B. Reheat is fitted in both cases.

and the Far East. He was appointed to the command of 613 Squadron in 1949 and in 1952 was appointed O.B.E. for his services to the Royal Auxiliary Air Force. At A. V. Roe and Co., Ltd., he had undertaken some of the test flying on the Vulcan, and demonstrated these aircraft in memorable fashion at the S.B.A.C. flying display.

Bristol Chief Test Pilot

ON January 1 next year Mr. A. J. ("Bill") Pegg, O.B.E., relinquishes his appointment as chief test pilot of the Bristol Aeroplane Co., Ltd., to become general service manager at the Weston-super-Mare works of Bristol Aircraft, Ltd. He will be succeeded as chief test pilot by Mr. Walter Gibb, D.S.O., D.F.C.

"Bill" Pegg

Walter Gibb

"Bill" Pegg, who is 50, joined Bristols in 1935 as assistant to Mr. C. F. Uwins, who was then chief test pilot, and succeeded him in 1947. In recent years he has been responsible for the Britannia flight-test programme. In his new capacity, Mr. Pegg will be responsible for after-sales service and training for all Bristol helicopters and other products from the factory at Weston and at Banwell.

Mr. W. F. Gibb, who as assistant chief test pilot of Bristol Aircraft has undertaken much of the Britannia flight test programme, holds the world's aeroplane height record (65,890ft) which he set up in the Olympus-Canberra on August 29, 1955.

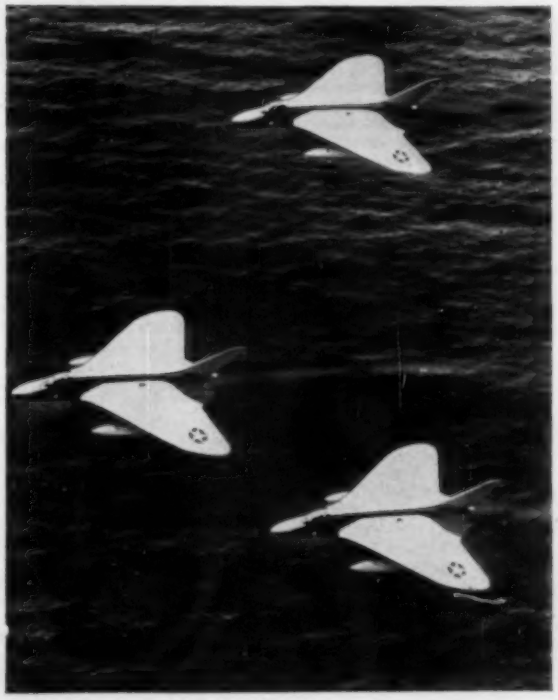
Alpine Operator

ON December 6, a talk on Alpine flying was given before the Ski Club of Great Britain by Capt. Hermann Geiger and his associate, Max Stampfli.

After the showing of several short films—emphasizing that the magnificence of the scenery was in inverse ratio to its suitability for aircraft operations—Capt. Geiger was introduced by H.E. the Swiss Minister, and spoke shortly (in French) about his work. Then slides and another film were shown, with a commentary in English by Max Stampfli.

Hermann Geiger started flying in the Alps about 26 years ago, and has since made over 7,000 mountain landings. His present aircraft, a Piper Super Cub (150 h.p. Lycoming), has a combined wheel and ski undercarriage, the skis being about 5ft in length and 1ft wide. During the years he has developed a special technique, based on a study of birds, which was described in a review of his recent book *Alpine Pilot* (*Flight*, October 12). The film and slides demonstrated that Nature's defences of her mountain fastnesses must never be underrated. Landing strips need to be surveyed in summer, and further careful reconnaissance made before a landing, in order to estimate the angle of slope and the state of the snow. The Föhn wind, whipping snow off the mountains, can reduce visibility to a few feet.

Though Capt. Geiger is probably best known for his rescue operations (to date, he has rescued 270 injured people), his normal work includes a great variety of tasks. Based at Sion, in the Rhône Valley, he has gradually built up a nucleus of aircraft, trained pilots and parachutists. Items transported include materials for the construction of mountain huts and other buildings, equipment for survey parties and food for isolated villages and animals. When ski-ing and climbing accidents occur, Geiger co-operates with the guides in bringing assistance. If people are trapped in avalanches, parachutists, medical supplies, sledges and skis are dropped on the spot. The parachutists (who have to use large-diameter canopies by reason of the rarefied air) receive their initial training with the R.A.F. at Abingdon before working from Sion. It has sometimes proved impossible even for Geiger to land a light aircraft near the scene of an accident, so a helicopter is to be operated next year in addition to the fixed-wing machine.



STING RAYS: Skimming low over the sea are these three Douglas F4D Skyray carrier-based intercepters of the U.S. Navy. A later development, the F5D Skylancer, is larger and has a more powerful version of the Pratt and Whitney J57 turbojet.

GEOGRAPHICAL INTELLIGENCE

—and Water-based Military Aircraft: a Significant Paper

PRESENTED recently at the Middle Atlantic Division, Association of American Geographers, National Research Council Auditorium, in Washington, the paper reprinted here is the work of Mr. Guy Mallery, advanced design project engineer of the Martin Company, Baltimore.

The lecturer began by saying that he would preface his talk with references to three apparently unrelated military incidents, the exact relationship of which would emerge later.

The first incident [continued Mr. Mallery] concerns Nazi General von Paulus who found himself fighting before Stalingrad with an offensive force of a quarter of a million men. That was his combat strength. Behind him some four million combat troops were holding the flanks of his support corridor, in order that the supplies might be brought to him. These four million combat-trained men might just as well have been parading down Unter den Linden as far as the battle was concerned. They contributed nothing to the battle strength at the critical point of the offensive. Von Paulus found to his sorrow that he could not afford to waste 16 combat troops for every one in actual contact with the enemy.

The second incident: At the outbreak of the Korean War it became apparent in General MacArthur's headquarters that a lightning counter-invasion, across the Inchon-Wonsan waistline of Korea, would rapidly break up the North Korean attack. Such an invasion was actually planned for July 12, 1950. It was finally conducted three months later. The reason for the delay was the lack of trained Marine amphibious troops and amphibious equipment in the Far East theatre. During the period between the date the invasion should have been mounted, and the date we were able to mount it, our country alone suffered almost 20,000 casualties. It was the most costly period of the entire Korean action.

Incident number three concerns the French in Indochina. Out of the jungle the French carved forward airstrips for the bombers supporting their operations. On to these airstrips rained Communist mortar and artillery fire. Communist small-arms fire prevented repair of the damaged runways. The fighters and bombers were unable to operate continuously. One by one the French lost their outpost garrisons and ultimately the principal combat areas.

These three incidents—von Paulus, the Marines in Korea, and the French in Indochina—were based and conducted on tactical concepts made obsolete by the advent of atomic weapons (even though in none of the three did the nuclear age play a part). The heavy logistics overhead that slowed von Paulus to a walk; the agonizingly slow surface shipping that delayed the Marine availability in Korea; and the dependence upon vulnerable runways that hurt the French in Indochina—all these mistakes will be far more costly when we consider that a future enemy would have both guided missiles and atomic weapons to take advantage of these shortcomings. An atomic weapon would make short work of the heavy stockpile concentrations necessary to fill a surface supply line. With atomic weapons and shock troops, a small country can today be overrun in a matter of hours by an aggressor. We would not have weeks to move to support any of the countries we are committed to; and, if a mortar shell can put an airstrip out of action for days, certainly the prospect of atomic craters in our forward runways indicates a need for other basing-means to preserve our bomber and fighter capabilities. Casting about for a means to eliminate many of the antiquated doctrines held over from the pre-atomic era, our military forces are today talking of reviving water-based aircraft as a means of combat-survival for military forces in atomic war.

For many years the water-based aircraft was an ugly duckling as far as the military service was concerned. It had low performance and was often cumbersome and hard to maintain. Now, however, new scientific advances have caused a renaissance of interest. We now find more and more of our military philosophy being built around water-based aircraft.

The Navy has a new water-based minelayer/bomber, the P6M SeaMaster, with great load carrying ability. The SeaMaster possesses speeds of over 600 miles an hour and has the flexibility of an aircraft that requires no prepared geographic position. There has been considerable discussion of a transport seaplane configured along the SeaMaster's lines; this aircraft could be built big enough to haul helicopters, guided missile batteries, tanks and any other pieces of equipment required for military forces anywhere in the world. Such an aircraft could land in almost any area in the world, for the rivers and the lakes that dot the land masses are ready-made landing fields.

But in the midst of all this talk and restudy of military doctrines one question keeps recurring: where can we *really* operate water-based aircraft? In the 1930s, it was customary for a seaplane enthusiast to spin the world globe, pointing out proudly that 75 per cent of the earth's surface was water and that all this was a ready-made landing field for a seaplane. In the 1940s the pendulum began to swing the other way. Water-based operating areas were pictured as requiring extensive take-off lanes, with elaborate concrete ramps, concrete aprons and elaborate shore facilities. Today we find ourselves somewhere in the middle of the road. We realize that the great ocean masses are important; but of equal importance are the water areas on the periphery and interior of the land masses. The atomic age has dispelled the idea that we can have brick-and-mortar facilities in forward areas of combat. To eliminate this, we are designing water-based aircraft today to spend the bulk of their operational lives in the water—serviced afloat and maintained afloat.

To return briefly to the three incidents, atomic-age combat philosophies today would envision von Paulus having, not four million, but twenty thousand men in his supporting line of communication, using water-based aircraft for the forward delivery of all combat supplies. Today's strategic mobility requirements seem to call for the Marines to be transported to Korea in eleven hours rather than seven weeks. Enemy airfield destructive capabilities in an atomic war could force our fighter and bombardment aircraft to be based, not on fixed facilities as the French in Indochina, but in the rivers, estuaries, and lagoons of the combat area, close to the fight, yet with runways invulnerable to enemy bombardment.

It is at this point in military history that our dependence upon the geographer and the geophysicist begins to increase greatly. With the static warfare of World War I, geography and related intelligence data were mainly concerned with the strategic implications of grand offensives. In World War II, where regional exploitation sweeps took combat troops into enemy territory on their own, the geographer was frequently called upon for tactical considerations as well as for the grand strategy. In the atomic war of constant mobility and flexibility the geographer and his sensitivity for terrain and cultural features becomes a vital cog in our day-to-day tactical operations.

The very mobility of our tactical forces creates a "numbers" problem for the geographer.

In the preambles to new military concepts we say very glibly that the rivers, lakes and bays which are a part of the geography

Second prototype of the Martin P6M SeaMaster. Development and production will continue, though both prototypes have been lost.

of most countries form an available and indestructible basing system for water-based aircraft. But, as of today, we do not know the real measure of the truth in that statement. We have carried on only limited site-selection counts in limited areas of the world. In Turkey, for example, we find that a water-based aircraft would have landing areas on the 2,000 miles of coastal waters and on the more than score of usable lakes. But these figures were based on broad-brush studies; we do not know today whether these constitute all the usable water areas in Turkey or merely a small percentage. We do not today have a clear picture of whether the lakes, for example, are distributed uniformly throughout what might be a combat area or highly centralized. It is much the same throughout every other area of the world.

But there is more—far more—than a mere counting and collation of usable areas to be made. Even before an area is studied for site selection, we must arrive at a methodology for accumulating and evaluating the truly important aspects of the data. One example of this: water-based aircraft are designed today so that take-off runs are roughly one mile. But for the geographer to search a map for one-mile stretches of water is not enough. Rivers and lakes are sometimes rimmed with hills and mountains. These "granite clouds"—as the airman calls them—might make the smaller water areas unusable.

Another problem for geographic intelligence: there is little point in landing in a river or lake unless the access roads are sufficient to provide a means of getting cargo either to a distribution point or to the using troops. And yet in the same breath we must add that our forces cannot depend on elaborate road systems because these fall into the category of prepared geographical features. These retain the vulnerability to enemy atomic and guided missile action that we are trying to get away from by our use of water-based aircraft.

On this same subject of cultural features, I might mention that one of our problems to date has been that the available water information gets more and more scarce as our studies move farther away from cultural centres. The world's so-called "backwoods" lakes, bayous, the undeveloped coastlines—these are made to order for atomic warfare bases. And yet it is of these sites that we know the least.

Suppose we move on to a new problem area. In our attempt to get combat troops into contact with an enemy before the enemy has the battle won, more and more military men are talking of using water-based transports. Particularly, our strategic reserve forces from the United States must move rapidly into whatever area of the world is the scene of aggression. Seven years ago, a Marine battalion stormed ashore on tiny San Nicholas island, off-shore California, in the first real test of amphibious operations from water-based aircraft. That operation proved the feasibility of the Marine-seaplane combination. The Marines have today in test a "flying LST" aircraft. [The Convair Tradewind—Ed.] This aircraft can beach itself much as the LST and landing craft did during World War II amphibious operations. However, the aircraft hull is still of aluminium. We may have to be more selective in regard to beach slopes, beach hardness and beach surface material. Surface-wave conditions which might not disturb the more ponderous LST might cause a water-based aircraft to broach in short order. In searching out and evaluating these conditions we must look to our geographer and our geophysicist for our principal guidance.

Consider another area. Our Secretary of the Navy tells us that the new bombardment seaplane, the SeaMaster, will be part of a mobile strike force, rearmed and refuelled both at sea and in the estuaries and bays of the world. It is contemplated that this highly mobile strike force will move its major operating areas as often as logistically possible in order to confuse the enemy. Site selection will be a major policy-level task. Our geographic intelligence must be able to tell us on a *daily* basis where the anchorages and maintenance areas can exist. A Norwegian fjord one day . . . the Channel Islands the next . . . a few days later maybe the Cyclades Islands off Greece . . . will be the base for this elusive bomber force.

In some areas it may be that the rebirth of water-based aircraft will alleviate part of the geographer's problem. Here we can refer briefly to weather. Quite obviously if a commander of a front-line troop unit is to depend entirely on air resupply for his existence, this resupply must occur regardless of visibility conditions in either the forward or the rear area. It is fortunate indeed that water-based aircraft can operate easily in fog or other bad flying-weather conditions. It is far easier for a seaplane pilot to orient himself in regard to his landing area by radar regardless of visibility conditions and his landing attitude is not as critical as is that of the landplane pilot. There are many historical examples of the safe operation of water-based aircraft in weather conditions completely prohibitive to other types of aircraft.

However, weather does have one effect on the water-based aircraft system; this, of course, is a reference to the icing problem in rivers and lakes. Ice is a problem for which we have the technical answer if we can only secure the necessary geographical knowledge on which to base our engineering. We have landed water-based aircraft on ice and through ice. We have operated water-based aircraft in both polar regions. We believe we know how to design a water-based aircraft so it can land on permafrost or on river ice. The aircraft of modern design need not be bothered by ice debris floating with a current. What we do *not* know today is the limiting point to which we should be designing our aircraft. For a transport operation in Poland should we expect the ice to be six inches thick (and hence we would have an ice debris problem) or three feet thick (where we would have the problem of physically supporting the aircraft on the ice)? What is the bearing strength of river ice in the Siberian marsh areas? Can we depend on flooding miniature ice-skating rinks above the permafrost? If we consider that the transport seaplane, particularly, may eventually weigh upwards of half a million pounds, what ought we to consider as a safe footprint pressure when the aircraft is sitting on ice? But beyond today's design problems, how is the force commander on the atomic battlefield to know on a day-to-day basis how to predict the ice conditions ahead of him? How is he to know whether Lake A, which is five miles to the rear, or Lake B, which still must be captured by tomorrow morning's offensive, is the best landing area for tomorrow afternoon's logistic resupply mission?

Martin P5M Marlins identify a freighter in the China Sea.

Leaving for a moment the rivers and lakes . . . we will have need of the open ocean during our future seaplane operations. Our defence forces, particularly, may be required to operate under sea-state conditions never before envisioned for seaplanes. Because of structure and hull shapes, we will have to draw a line somewhere between what is an acceptable sea and what is too rugged to attempt. But before we can know what line is valid to draw, we must know more of the sea as it is. Oceanography will be the main policy-maker in determining the extent to which we can effectively use sea landings.

My whole train of thought here in this paper can probably be summed up in three sentences: First, one of the keys to our new concepts of nuclear-age warfare lies in water-based aircraft—transports, bombers, fighters. Second, a major key for unlocking the true potential of these water-based weapons is site selection and evaluation—for which we must develop geographic intelligence and know-how. Third, we do not today have even a good start toward gathering or toward knowing how to evaluate the data needed for site-selection studies. That is the whole thing in a nutshell.

A rifleman with the most modern gun, but without a bullet, is not a weapon system. In the same manner, the most modern seaplane, capable of the greatest military impact, is not an atomic-age weapon system if we fail to predict, to select, and to use the world-wide availability of its operating sites. Here is an area where our military complex—its success or its failure—may one day boil down to how well geography and its related sciences have been phased into our newest weapons systems.

LOW DUMP by the Edgar Percival E. P. 9 of the Manawatu Aerial Topdressing Co. of Palmerston North, New Zealand, shows the machine's load-jettison ability in striking fashion.

HERE AND THERE

Preparation for "Vanguard"

ON December 8 the first test rocket of the earth satellite programme was fired from the U.S.A.F. missile test centre at Cape Canaveral, Florida. According to a Defense Department announcement, it attained a speed of 4,000 m.p.h. and an altitude of 125 miles before ending its flight in the Atlantic about 180 miles from its launching base. The rocket—a Martin Viking—was fired to test instruments and gather data.

Talking the Same Language

THE U.S.A.F. is recruiting British civilian air traffic control officers for duty at its bases in the United Kingdom. Forty-four ex-R.A.F. and F.A.A. men are being engaged, and half this total has already been enrolled through the Air Ministry. They are now taking a course with the U.S. Military Air Transport Service at Fairford, and when ready for service will operate alongside American controllers. Maximum pay will be £1,250.

U.S.-Canada Traffic Radar

THE U.S. Civil Aeronautics Administration and the Canadian Department of Transport have jointly been undertaking moves towards eventual complete traffic-control radar coverage of the North American Continent. Orders totalling over $13m have been placed for equipment, installation of which will begin next year. Raytheon is principal contractor.

Hunter Pilot "Fired"

THE Air Ministry last week-end released the story of a remarkable escape by an R.A.F. pilot, who survived involuntary ejection from his Hunter whilst making dummy attacks on a Canberra at more than 42,000ft. The pilot, F/L. Roy Watson, said that he heard the seat cartridges fire and found himself shot out through the canopy. Temporarily stunned (his helmet saved him from serious injury, though a moment later it was torn off, together with his oxygen mask) he fell to 10,000ft, when the automatic release operated, freeing him from the seat before deployment of his parachute. He injured an ankle on landing. The previous official highest ejection in this country was at 40,000ft by S/L. J. S. Fifield, in a Martin-Baker seat, but with the full protection of face-blind and oxygen.

Aeronautical Specialization

THE Canadian Aeronautical Institute is to establish specialist sections—as distinct from its territorial branches—for members interested in particular branches of the service, e.g., aerodynamics, structures, inspection, rocketry.

R.34 Memorial

A PROPOSAL that the Air League of the British Empire should erect an R.34 memorial at East Fortune Hospital, East Lothian, has been approved by the South-Eastern Regional Hospital Board. It was from East Fortune that the airship left in 1919 to make the first double crossing of the Atlantic by air. The League has already obtained permission for the erection of a memorial at London Airport (*Flight*, July 13).

Mild and Britannia

ON November 28 the new Britannia Inn on the Patchway Estate, Bristol, close to the Filton works of Bristol Aircraft, Ltd., was opened by Mr. Peter Masefield, managing director of Bristol Aircraft. Its sign depicts an airborne Britannia.

Santos-Dumont Stamps

FIVE new air-mail stamps have been issued by Brazil to mark the 50th anniversary of the first official aeroplane flights in Europe, made in France by the Brazilian pioneer airman Alberto Santos-Dumont. The design for all five values depicts his "14 *bis*" in flight.

Single or Return?

ON December 15 the first of a series of four discussions on astronautics, under the overall title of *Ticket to the Moon*, is to be given in the B.B.C. Light Programme. In the opening broadcast A. V. Cleaver, F.R.Ae.S., chief engineer (rockets), de Havilland Engine Co., Ltd., will discuss the question "*How do we go?*" with Peter Scott.

Redundancy Reported

IN a written Parliamentary answer last week Mr. Iain Macleod, the Minister of Labour, said that 1,796 workers in the aircraft industry had become redundant this year and that "some short-time working" was likely. He gave the following regional breakdown of the 1,796 total: London and South-East, 1,265; Eastern, 18; Southern, 322; South-Western, 70; Midlands, 41; Scotland, 80.

Spotters' Album

A SET of 24 coloured cards depicting and briefly describing current types of jet aircraft of all nationalities has been produced for R. L. Jones and Co., Ltd., of Mansfield, Notts, makers of Sunecta glucose drink. A card is included with each bottle and an album is available for the whole series. The drawings, by R. Ward, are accurate representations.

HILL-COUNTRY APPROACH to land by the Auster Agricola, also operating on topdressing work in New Zealand. Superphosphate supply and loader are waiting at the end of the field.

THE ERA OF THE ELAND IS BEGINNING...

The case for ELAND conversion

To forward-looking operators of medium-haul airlines the case for ELAND conversion becomes clearer and more convincing month by month. Increasingly they see that ELANDS point the way to the achievement of better performance, greater earning capacity, and greater dependability in service from well-proven airframes.

No beat, whine or whistle

ELANDS possess to the full that inherent asset of the turbo-prop—a greatly reduced noise level. And over and above this they have an inherent asset of their own—a complete absence of beat, whine or whistle. The passenger appeal implicit in this needs no emphasis.

Flexibility of power

ELAND design provides a wide range of power in a one-sized package. The 3,000-4,200 e.h.p. range of ELAND engines differ nothing in size and only little in overall weight. This flexibility will enable operators to standardize on one basic engine and nacelle design where two or three different types of piston engines are now required.

Conversion of the Convair 340

The Napier Eland Convair—a Convair 340 which we bought from the makers and converted to ELANDS—has proved the simplicity of ELAND installation, the low cost of conversion and the increased profits that accrue from ELAND operation.

From studies made of the published direct operating costs (including depreciation) of a number of typical airlines, it is proved that in the light of our guarantees a converted aircraft will be cheaper to operate—whether the costs are calculated on the basis of aircraft miles, ton miles or passenger miles. The ELAND-engined Convair 340 can carry its maximum payload 930 miles farther than piston-engined Convairs, and its cruising speed is 50 m.p.h. higher.

In short, we offer to operators of the Convair—and other medium-haul 'planes—an airliner with a new lease of life at a cost which will be written off over a relatively short period. That is the essence of the case for ELAND conversion.

Eland conversion means increased profits to the progressive airline

Three examples of successful Napier Eland conversions: the Convair 340, the Elizabethan, the Varsity.

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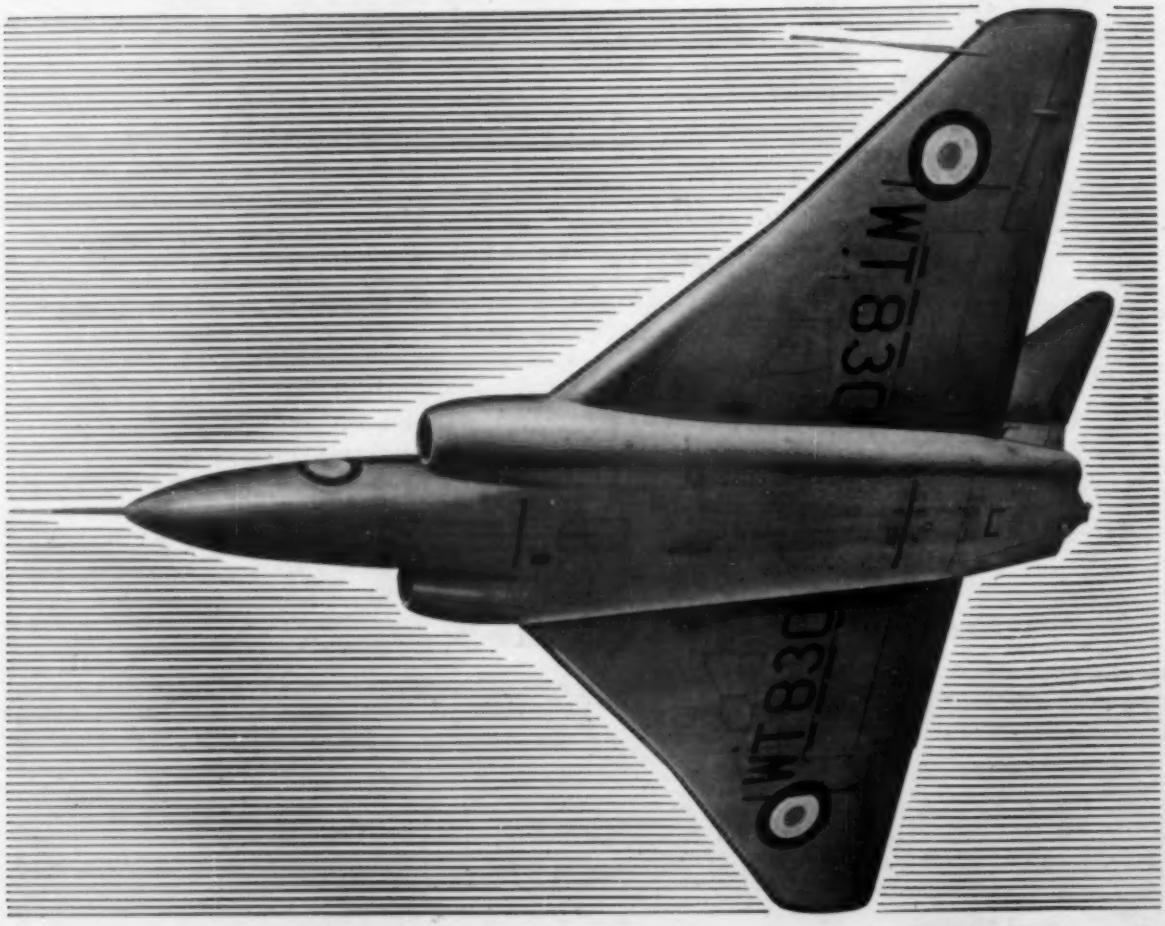
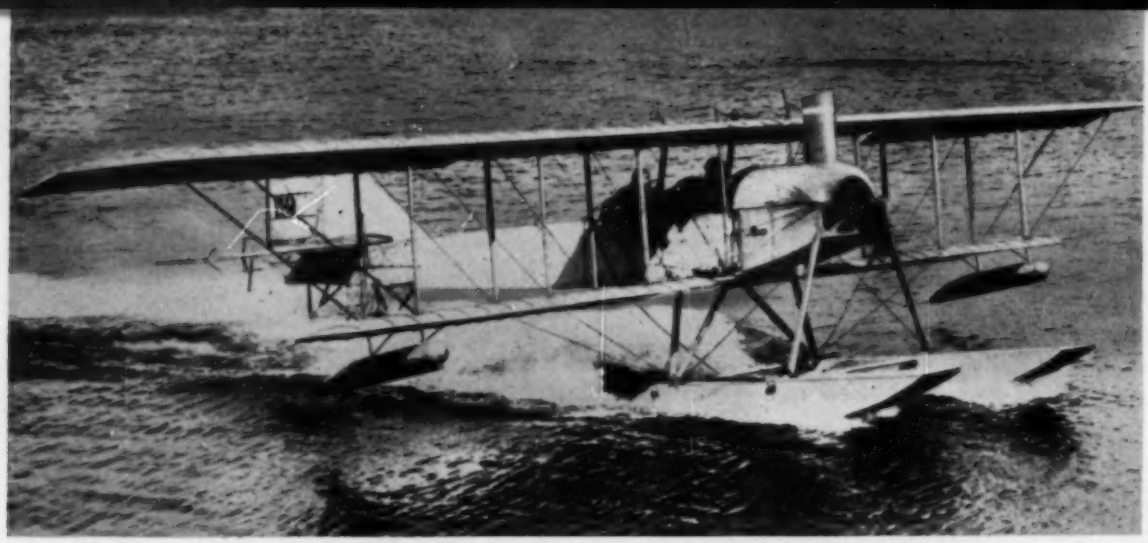
Then and now



GLOSTER recommend Castrol



One of the best known Short "Folders": No. 119, with three-bay wings.

THE SHORT SEAPLANES

HISTORIC MILITARY AIRCRAFT No. 14 PART I By J. M. BRUCE, M.A.

JUST as the F-boats—studied in this series a year ago—were the outstanding British flying-boat type of World War I, so were the Short seaplanes predominant in the floatplane category. The development, manufacture and use of these classic aircraft are reviewed in the present history. It can be claimed that, for the first time, the story of the Short seaplanes is being told in full; in the past, even the makers have been unable to fill gaps in the records of the numerous variants. The author acknowledges his indebtedness to Mr. Bruce Robertson, who provided much of the information relating to serial numbers, and to Mr. H. H. Russell for some of the facts on which the history is based.

IT might well be said that the aviation industry of the world was born in Battersea in the year 1900. There, under a railway arch, the brothers Eustace and Oswald Short began to manufacture balloons on a commercial basis. Eustace Short had taken up the sport of ballooning in 1897, and it was not long before his younger brother Oswald, then only fifteen, began to accompany him on his voyages. Their decision to make balloons of their own was inspired by reading *Travels in the Air*, a book written by the pioneer aeronaut James Glaisher, and the first Short balloon was made in 1898.

The early Short firm was sufficiently successful to be able to continue to exist at a time when ballooning was, first and foremost, a sport: some of their products participated in the balloon races of that leisurely, halcyon age. In 1905, however, the brothers Short received a contract from the Government of India for the supply of captive war balloons (presumably for artillery observation duties); and in the following year they were appointed club engineers to the Aero Club. By that time, reports of the activities of the Wright brothers in America had been studied with interest by the members of the Aero Club. The Shorts were no less interested, and Eustace was convinced, after seeing Wilbur Wright fly at Le Mans in 1908, that the heavier-than-air flying machine was superior to the balloon.

The two brothers discussed how they might begin to make aeroplanes, but concluded that they did not possess sufficient technical knowledge to undertake the production of aircraft which were relatively much more complicated than balloons. They approached their elder brother Horace in the hope of arousing his interest in their project. Horace Short, then 35 years old, was an expert on steam turbines and was engaged in experimental work for the Hon. C. A. Parsons in Newcastle. His response to the proposition put to him by Oswald Short was characteristic: "I will come in with you, and I will give you three days," he said. "If by that time you have not made up your mind I will start without you."

Horace Short gave up his post with Parsons, and the three brothers began work on heavier-than-air machines forthwith. Their first product was a glider, a scaled-down powerless Wright biplane which was built for the Hon. C. S. Rolls. In the same year (1908) work was started on Short No. 1, a pusher biplane which owed something to contemporary Wright designs. Originally fitted with a car engine, it failed to fly; but there are indications that it later succeeded when fitted with a Bariquand and Marre engine. Short Brothers moved their works from Battersea to Shellbeach, Isle of Sheppey, in 1909, and Short No. 1 was still there in November of that year.

In 1909, Short Brothers received the first contract ever given for the quantity production of aircraft. This was for the manufacture of six Wright biplanes to the order of Wilbur and Orville Wright themselves, and intended for use in England. The first was purchased by the Hon. C. S. Rolls, and the others by Alec Ogilvie, Frank McClean (later Sir Francis McClean), the Hon. Maurice Egerton (later Lord Egerton of Tatton), Cecil Grace, and the Hon. C. S. Rolls. This last machine was later bought by Alec Ogilvie from the executors of the Hon. C. S. Rolls.

On October 30 of that same year, Mr. J. T. C. Moore-Brabazon (now Lord Brabazon of Tara) flew Short No. 2 for a distance of 1½ miles to win the *Daily Mail* prize of £1,000 for the first flight of one mile by an all-British aeroplane. This aircraft bore a resemblance to the contemporary Wrights and was powered by a 50-60 h.p. Green engine driving twin pusher propellers.

The next Short was generally similar to No. 2 but was smaller and much more workmanlike. It was exhibited at Olympia in the 1910 Aero Show; power was provided by a 35 h.p. Green engine, and the machine was priced at £650. Fully loaded it weighed 857 lb, and the wing loading was 3 lb/sq ft.

Between them, the Shorts Nos. 1 and 2, the Olympia Show machine and the Wright biplanes account for only nine of Short Brothers' works numbers—ten at most if the Wright glider be included—yet the next Short aircraft of which adequate records have survived was No. 27, properly the S.27. In this aircraft Short Brothers abandoned the Wright configuration in favour of a conventional box-kite form, and the S.27 most closely resembled the contemporary Howard Wright biplane. It was an equal-span biplane with monoplane tail unit and forward elevator, powered by an eight-cylinder E.N.V. engine. The S.27 was flown with distinction by Cecil Grace, notably at the Midland Aero Club's meeting at Dunstall Park, Wolverhampton, June 27-July 2, 1910.

The S.27 might be said to have provided the design basis for several of its successors. What their precise designations were is now impossible to establish, for the circumstances of the period led to the application of a bewildering variety of numerical designa-

Early history: Modified Short S.27 biplane with nacelle.

THE SHORT SEAPLANES . . .

(Right) Lt. Longmore, R.N., leaving the modified S.27 (fitted with air-bags) after successfully alighting on the Medway.

(Below) The original Short tractor biplane built for Mr. Frank McClean.

(Bottom) Tractor biplane supplied to the Admiralty and given official number T.5.

tions to the various Shorts. Each aircraft had a Short works number, but even that was not altogether dependable as a means of identification, for several machines were extensively rebuilt. Secondly, each of the Shorts purchased by Mr. Frank McClean was given a number by its owner, and some of these were subsequently given an Admiralty number under its 1911 numbering scheme, which was used until the formation of the R.F.C. on May 13, 1912. A typical example of the confusion which could exist was provided by the Short biplane which rejoiced in the draughty nickname of the "Vacuum Cleaner." Mr. McClean gave it the number 11 in his personal series, and after it had been handed over to the Admiralty it was given the number 27—but it was not, of course, the Short S.27. With regrettable looseness, contemporary writers would refer to both aircraft as the "Short No. 27." It is not known whether any of those early Admiralty machines survived long enough in their original form to be again renumbered under the standard British numbering scheme which was introduced at the end of 1912.

According to Short Brothers' own records, the next significant variant had the works number S.34, but it seems possible that this may have been a confusion with the Short which had the early Admiralty number 34. It was simply a pusher biplane similar to the S.27 but had strut-braced extensions on the upper wings; it was powered by a 50 h.p. Gnôme rotary engine. It may be significant that in *Flight* of February 10, 1912, an aircraft of this type was described as the Short biplane No. 32. The type should properly be described as a modified S.27. At least one later example of this type had a small nacelle for the pilot and passenger.

It was to Frank McClean that the R.N.A.S. owed its beginning. Early in 1911 he placed two of his Short biplanes at the disposal of the Admiralty for the training of naval officers. As is now well known, the first four officers to receive flying instruction were Lts. C. R. Samson, R. Gregory and A. M. Longmore of the Royal Navy, and Capt. E. L. Gerrard of the Royal Marine Light Infantry. They reported at the R.Ae.C. aerodrome, Eastchurch, on March 1, 1911. Their flying instructor was G. B. Cockburn, they received technical instruction from Horace Short, and all had qualified for their pilot's certificates within six weeks.

The exact nature of the two Shorts is uncertain, but it seems probable that one may have been of the basic S.27 type and the other a modified S.27. In October 1911, Lt. Samson succeeded in persuading the Admiralty to buy the two aircraft from Mr. McClean and to establish a naval flying school at Eastchurch. As the naval school expanded, other Short biplanes were purchased, including the remarkable twin-engined Tandem Twin and Triple Twin machines, each powered by two 50 h.p. Gnômes. These ingenious aircraft were the first multi-engined aeroplanes built in Britain, but they contributed nothing to the development of the Short seaplanes and are therefore not appropriate to this narrative.

The end of 1911 saw three major steps taken towards the development of the seaplanes. Assisted by Oswald Short, Lt. A. M. Longmore (now Air Chief Marshal Sir Arthur Longmore, G.C.B., D.S.O.) devised means of fitting elongated air-bags to the modified S.27 bearing the Admiralty number 38. Two large air-bags of near-streamline form were attached to the undercarriage struts, and a third air-bag was mounted under the tail. On December 1, 1911, Lt. Longmore successfully alighted on the Medway in this aircraft; after being brought ashore by a naval party the Short was flown back to Eastchurch.

On January 10, 1912, Lt. Samson made the first take-off from the deck of a British warship, flying the same modified Short S.27 with its air-bags attached. At Samson's instigation, a special platform had been built at Chatham Dockyard and was mounted over the bows of H.M.S. *Africa*, and his take-off was made with the vessel at anchor off Sheerness. In May 1912 Samson repeated the performance from H.M.S. *Hibernia*, but this time the ship was steaming at 15 kt. He was again flying the modified S.27, No. 38.

It is scarcely surprising that this historic aeroplane has been repeatedly misrepresented as having been a Short S.38 at the time of its most celebrated flights. The aircraft known as the S.38 was a two-seat pusher landplane which was later built in some numbers and saw limited service during the war. In its best-known form it had a small forward elevator perched on the prow of its unusually long nacelle, and underwent detail modification from time to time.

What makes this welter of numerical designations infinitely worse is that, by October 1912, the modified Short S.27, No. 38, had been drastically rebuilt into a form in which it virtually became the prototype of the type S.38—and was then given the official serial number 2 in the new series.

Interesting as the Short S.38 was in its own right, its history is not relevant here. The next step in the late-1911 events which founded the great series of Short seaplanes was the completion of the first Short tractor biplane. This machine had been designed for Cecil Grace in 1910, but the plans were shelved after his death on December 22 of that year. The drawings were shown to Frank McClean in the autumn of 1911, and he was so favourably impressed that he ordered one machine; it was completed in November and first flew early in 1912, when it was tested by Cdr. Samson and Capt. Gerrard. The rear fuselage was originally left open, but was later covered in. The engine was a 70 h.p. Gnôme.

For the Admiralty a similar tractor biplane was built in the spring of 1912. It was given R.F.C. Naval Wing number T.5* and differed from Mr. McClean's aircraft only in having shorter wings. The lift struts of T.5 were attached to the extreme tips of the upper wings, whereas on the original aircraft their upper ends lay a short way inboard of the tips. The naval machine was fitted with a broad central float at an early stage in its career and was flown successfully as a floatplane. A 70 h.p. Gnôme Short seaplane with centre-float undercarriage was still in service with the unprefixed official serial number 5 in October 1913. It could have been the same aircraft, but by that time the extensions of the

**For a few months in the summer of 1912, after the formation of the R.F.C., aircraft numbers had prefix letters. Those of the Military Wing had been "A" (balloons of No. 1 Company, Air Battalion, Royal Engineers) and "B" (aeroplanes of No. 2 Company); as far as is known these continued in use, and were later supplemented by "F" (C.F.S. aircraft). The prefix letters on Naval Wing aircraft were "H" (hydro-aeroplane), "M" (monoplane) and "T" (tractor).*

upper wings had king-post and cable bracing, and a deeper top decking had been fitted about the cockpits.

Meanwhile, another Short seaplane had appeared. This was the Short S.41, a two-seat tractor biplane powered by the 100 h.p. Gnôme ten-cylinder two-row rotary. It has been said that the S.41 first appeared as a landplane and was later fitted with floats. That may well have been so, but its resemblance to the T.5 tractor biplane may have led to a confusion of identities. Certainly it seems that no photographs of the S.41 as a landplane have survived.

A Short S.41 was in service with the Navy in May 1912 and flew successfully at the review of the Fleet which was held at Weymouth on May 8. During the exercises which followed the review, it was flown from the naval air station at Portland and, apparently, from the trackway on H.M.S. *Hibernia*, using a kind of trolley under the floats. An illustration in *Flight* of May 18, 1912, shows the S.41 and the modified S.27 No. 38 on *Hibernia*.

The S.41 was essentially a very simple aeroplane and in general configuration strongly resembled the original tractor landplane, but it could be distinguished from the seaplane version of T.5 by its twin-float undercarriage and uncovered centre section. The floats were simple pontoons, each with a single step, and there were stabilizing air-bags under the lower wings; the tail was supported by a similar air-bag. The two-bay wings had square tips, the lower mainplanes being cut off short at the outer interplane struts. The upper wings had strut-braced extensions, and they alone were fitted with ailerons, single-acting surfaces which had no interconnecting balance cable and therefore hung down limply when the aircraft was at rest. The slender fuselage was mounted at mid-gap between the wings, and the cowling of the engine was rudimentary. The angularity of the tail unit was in keeping with the appearance of the rest of the aircraft; the rectangular tailplane was mounted on top of the upper longerons some way ahead of the sternpost. There was no fin, and the rudder was a balanced surface. Construction was of wood throughout, cross-braced with wire and covered with fabric.

Cdr. Samson flew the S.41 a good deal, and in June 1912 he succeeded in transmitting wireless messages from the aircraft off Harwich. The transmitter was a practice set of the type used in destroyers, and the messages were received at distances of three, four and, occasionally, ten miles. Two months later, Lt. Raymond Fitzmaurice, R.N., was placed in charge of all wireless experiments connected with naval aircraft.

In October 1912 the original S.41 was at Carlingnose on the Firth of Forth, where it was again flown by Cdr. Samson. By that time it had acquired the official serial number 10.

In 1913 two more Short seaplanes were delivered to the Naval Wing; they had the official serial numbers 20 and 21. These aircraft had the 100 h.p. Gnôme and were also known as S.41s. To the original S.41 they bore a resemblance which, in those days when standardization was unknown, was strong enough to justify the retention of the designation. On Nos. 20 and 21 the construction of the wings differed in detail: the extensions were braced from king-posts, double-acting ailerons and a large rudder were fitted, the floats had no steps, and the outboard stabilizing floats were under the extreme tips of the lower wings. All the floats had several watertight compartments, and the tail float was fitted with a water rudder. The pilot sat in the front seat, and the rear cockpit could accommodate two passengers.

The Short seaplane No. 20 was in service with the R.F.C. Naval Wing in May 1913. In that month it was the vehicle for tests of the Rouzet wireless telegraphy apparatus, a transmitter which was a great advance over the set which had been fitted to the original Short S.41 during the previous year. M. Lucien Rouzet was the engineer at the Eiffel Tower wireless station. In 1912 he designed a W/T transmitter which was more compact and considerably lighter than any other apparatus which had been made up to that time: it weighed only 70 lb.

Lt. Fitzmaurice was permitted to go to Paris to examine the Rouzet set. He realized at once that it was admirably suited to installation in aircraft; it had in fact been successfully tried in a French aeroplane. The Admiralty bought four, and M. Rouzet agreed to come to England to assist in making the first installation in an aircraft. Lt. Fitzmaurice has recorded that the Rouzet transmitter was first fitted to "one experimental twin-propeller machine which no one liked; this machine was, however, the only possible one to which an apparatus could be fitted, and even then it had to be fixed on a platform outside the fuselage and streamlined in." The aircraft in question may have been the Short Double Twin. The trials of the Rouzet set were successful, and clear signals were received at distances of up to 20 miles; on one occasion a destroyer 45 miles away picked up the aircraft's signals.

The Short No. 20 was flown by Sub-Lt. J. T. Babington during the trials of its Rouzet set. It was then based at the Isle of Grain. When the royal yacht brought the King back from Flushing No. 20 formed part of the escort. On meeting the yacht, the aircraft sent a W/T message in salutation: that was the first occasion on which a British monarch received a salute by W/T from an aircraft. The R.N.A.S. station at Grain maintained wireless contact with the seaplane throughout, even when it was 50 miles away.

Immediately after these trials, No. 20 was sent to the R.N.A.S. station at Great Yarmouth, whence it participated in the naval manœuvres of 1913. On July 23 and 26 heavy surf made it extremely difficult to beach the seaplane. The wooden pontoon floats of those early seaplanes were frail structures; consequently the aircraft had to be handled with the greatest skill and care. Nor was beaching the only difficulty attending the operation of the Short, for one of the ratings of Great Yarmouth air station recorded this heartfelt note: "No. 20 occasionally flew, but No. 29 [a Maurice Farman seaplane] hardly ever. To start No. 20 up was a feat of strength and was rarely accomplished in a short time."

Launching and beaching the seaplanes presented so many difficulties that some of the officers at Great Yarmouth set about the development of a form of beaching gear. Lt-Cdr. R. Gregory and Eng-Lt. E. W. Riley collaborated with Mr. White, an official of Chatham Dockyard, to produce a device which had the resounding name of the "G.L.W. wheel float attachment": the initials

(Top) T.5 floatplane with triple-float undercarriage.

(Above) Close-up of the T.5 floatplane.

(Left) The original S.41, distinguishable from the T.5 by its twin-float undercarriage.

THE SHORT SEAPLANES . . .

G.R.W. were derived from the surnames of the joint inventors. Early in 1914, experiments with the G.R.W. gear were conducted with the Short seaplane No. 20 at Great Yarmouth. A pair of pneumatic-tyred wheels were fitted to each float and could be released either when the aircraft was afloat or airborne; a single sprung wheel was attached to the tail float.

Thus equipped, the Short simply taxied straight into the sea and the wheels were released when it was afloat: without the G.R.W. gear, a cumbersome trolley and a large handling party would have been needed to launch the seaplane. For beaching, the Short was brought close inshore and the wheels attached; it was then taken a short way out to sea and taxied straight up the beach. The tests were performed by Lt-Cdr. Gregory himself with Eng. Room Artificer H. Hackney, R.N., as passenger. The original proposals envisaged the flying of seaplanes from land, using the wheels for take-off, but there is no record that No. 20 was ever so flown. Later in 1914 further experiments were to have been undertaken but were abandoned when war broke out.

No. 20 continued in service at Great Yarmouth until the summer of 1915, and on June 12 went to look for a hostile submarine which had been reported off the coast. On that occasion the ageing Short was flown by F/L. Chichester Smith and Pty. Off. Jones; and the carrying of an observer must have been an unusually good performance if the following recollections of an officer of Great Yarmouth air station are correct:—

"The general routine of patrols was a submarine patrol on the Short some time during the forenoon on those very rare occasions when the seaplane would get off. It was a two-seater machine that would only carry the pilot, and was noted for its capacity to sling oil. The pilot flew with two 16-lb Hale bombs on his lap, bomb frames being far too scarce in those days to fit to an ordinary seaplane, besides the extra weight stopped her 'getting off.' On one occasion it was known to have reached the prodigious altitude of 1,000 feet; the pilot, a very harmless, innocent 'quirk,' hardly fledged, straight from Chingford, having struggled with the machine for 2 hours, came home so full of life that he told everyone, even the Commanding Officer, of his experience. 'What the hell do you mean by doing a submarine patrol at that height for? You would never see a submarine from 1,000 feet, even if it was there!' and that was all the thanks he got from his C.O."

Contemporary with the Shorts Nos. 20 and 21 was another seaplane which bore a general resemblance to the S.41 (and has indeed been wrongly described as an S.41) but was a new and different aircraft. The new Short was exhibited at the 1913 Aero Show at Olympia, and was revealed as a two-bay tractor biplane with strut-braced extensions on the upper wings. Power was provided by an 80 h.p. Gnôme which was unusually fully cowled: the engine was in a fore-and-aft mounting and only a semi-circular aperture admitted cooling air, for a cowling panel was fitted under the engine. The lower mainplanes were attached directly to the fuselage, whereas all the previous Short tractor seaplanes had had their fuselages in the mid-gap position. There was no fin, and the rudder resembled that of the S.41; the tailplane, however, was mounted between the upper and lower longerons—that of the S.41 was carried on top of the fuselage. The floats were simple step-less pontoons; a stabilizing float was mounted under each lower wing tip, and there was a small tail float. As exhibited, the Short had seats for two passengers in addition to the pilot.

The Admiralty purchased several of the aircraft which were exhibited at the 1913 Olympia Show, among them the 80 h.p. Short seaplane. In the Naval Wing the machine had the official serial number 42 and was normally flown as a two-seater. It was used as one of the aircraft attached to Blue fleet in the 1913 naval manœuvres, when it was based at Leven. By that time a large triangular fin had been made by filling in the space below the strut which braced the top of the rudder. On July 25, No. 42 patrolled the Firth of Forth for 1 hr 34 min without sighting any units of the Red fleet, but an attempted repetition of the patrol next day had to be abandoned owing to engine trouble after half an hour. On July 27 the Short stove in one of its floats when alighting, and had to be towed in by a torpedo boat.

The 80 h.p. Short is next heard of as a landplane, in which form it was flown at Montrose. The undercarriage had a rather home-made appearance, and looked as if twin wooden skids had simply been substituted for the floats, using the original float attachment struts. A pair of wheels on a cross axle were lashed to the skids by rubber cord.

The aircraft never reverted to being a seaplane. When Cdr. Samson took the Eastchurch squadron of the R.N.A.S. to France on August 27, 1914, among the assorted aircraft which formed the unit's equipment was No. 42, still on wheels. It seems unlikely that the Short saw any action for, listing the organization of his unit at mid-September 1914 Samson wrote: "Headquarters flight at Morbecque. This sounds grand, but at this time only consisted of No. 42." Nor did the machine survive for long: Samson himself wrecked it on September 28, 1914, by flying it into a tree after the engine failed on take-off. By that time the "aeroplane was really on her last legs; but as we were so woefully short of aeroplanes we had to use her."

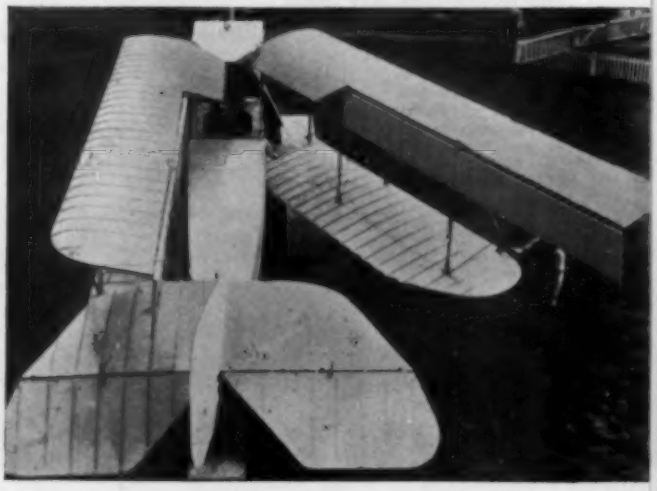
Short S.41 No. 20, with G.R.W. wheel/float undercarriage.

Although unique, the Short biplane No. 42 can be regarded as a link between the S.41 and a larger military seaplane which appeared early in 1914. This new type was powered by the 100 h.p. two-row Gnôme, but was similar in general appearance to No. 42: it had an engine cowling of similar aspect, and the lower mainplanes were attached directly to the fuselage. The wings had three bays of bracing, and there were strut-braced extensions on the upper wings, which bore the long, single-acting ailerons. The tail unit incorporated a balanced rudder and a triangular fin, and the tailplane was mounted on top of the upper longerons. The floats were wooden pontoons, and each was attached to the fuselage by four struts; a small stabilizing float was mounted under each lower wing tip, and a wooden tail float was fitted.

This aircraft was known to its manufacturers as the improved S.41. Precisely why it was so named is obscure, for the only thing it had in common with the S.41 was the 100 h.p. Gnôme engine, and it could not be said to resemble the earlier type in any significant way. In the Service, the new Short was known as the Short seaplane, Admiralty Type 74, a cumbersome title which was usually abbreviated to Short 74.

That designation was much more specific than the almost meaningless name, Improved S.41. It provides the first example of a Short seaplane type having as its designation the serial number of a typical aircraft. This system of aircraft nomenclature, if such it can be called, became a more-or-less standard practice with the Admiralty; but there seemed to be little or no consistent method of selecting the serial number by which any given type was to be known. In some cases the serial was that of the first aircraft of the first production batch, and the Short 74 was one such. Other typical examples were the Avro 179 (the first Avro 504 supplied to the Admiralty), the Sopwith 807 seaplane, and the big A.D. 1000 three-engined seaplane. More frequently, however, the number chosen was merely that of some typical production aircraft: it may have belonged to the machine which was the subject of performance tests for the type in question. Examples of this case are much more numerous, and include the Wight 840, Sopwith 860, Grahame-White 1600, Sopwith 806, 9400 and 9700 (respectively the Sunbeam-powered Gun Bus, the two seat version of the 1½-Strutter and the single-seat 1½-Strutter), and later Short types—the 166, 827 and 830—which will be discussed in this history.

The effectiveness at the time of its use of this somewhat tortuous method of providing aircraft designations is not now known, but



Early "Folder" with two-bay wings.

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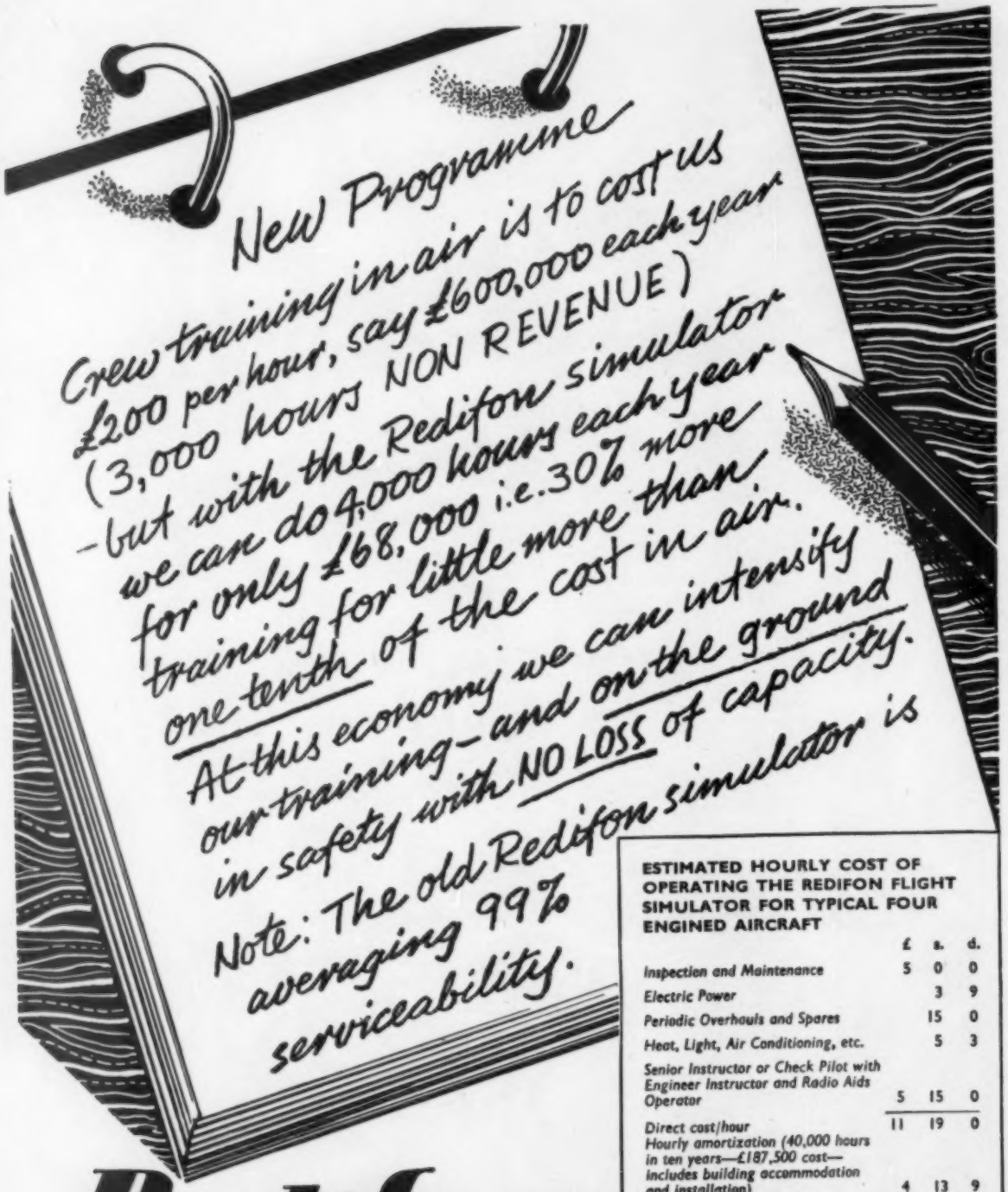

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THE SHORT SEAPLANES . . .

Short S.70 pusher seaplane.

it has undoubtedly caused a great deal of confusion, uncertainty and inaccuracy in latter-day references to the aircraft concerned.

But whatever it was called, the Short 74 was a good seaplane. A few days before the Naval Review which was held at Spithead between July 18 and 22, 1914, there took place at Calshot a conference of the commanding officers of R.N.A.S. seaplane stations. There the opinion was expressed "that the 100 h.p. Gnôme-engined Short seaplane was the most reliable machine in the Service, but they felt that its value would be enhanced by the fitting of sprung main floats and folding wings."*

No reference has been found which mentions any Short 74 being in service with the Naval Wing of the R.F.C. before 1914. Early in that year a few went to seaplane stations at Leven, Dundee and Calshot, and several were flown at the Naval Review. Within a fortnight of the end of the Review, Britain was at war, and the Short 74s were used as coastal patrol aircraft. Their one moment of operational glory came in the raid on Cuxhaven, which was made on Christmas Day, 1914. Other Shorts participated, and the action will be described later in this history.

Rather remarkably, the Short 74 was preceded in the Service by another Short seaplane which not only had the appearance of being a later design but also had a later serial number. This was the Short No. 81, which was in service in the summer of 1913, and was soon followed by No. 82, a second machine of the same type. In appearance it was very similar to the Short 74, but its wings had two-bay bracing with extensions on the upper mainplanes, and it was powered by the big fourteen-cylinder Gnôme rotary of 160 h.p. The engine cowling was surmounted by an impressive funnel-like exhaust stack which was designed to expedite the removal of exhaust gases. Although unremarkable in appearance, No. 81 was nevertheless an aircraft of historical importance, for it introduced the Royal Navy to folding wings.

The idea of arranging an aeroplane's wings to fold was not completely new. As early as 1911 a French monoplane, the de Marçay-Mooneu, was built with folding wings and was flown at Issy-les-Moulineaux. It was not a very practical design, however, whereas the mechanism evolved by Horace Short in 1912 was a straightforward workmanlike job. The wings were hinged on the rear main spars and folded backwards; bayonet joints were fitted to the front spars to lock the wings in the extended position, and the bracing wires had quick-release catches. Horace Short patented his invention, but the only royalties paid to the company by any other manufacturer were no more than £15. That sum was paid by Mr. T. O. M. (now Sir Thomas) Sopwith, presumably in respect of his company's use of the device on the Sopwith 807 and 860 seaplanes.

For the naval manœuvres of 1913, the Short seaplane No. 81 was put aboard the seaplane carrier *Hermes*, which was attached to the Red fleet. The aircraft was equipped with Rouzet W/T apparatus, and made two successful reconnaissance flights on June 21, 1913. On July 24, No. 81 took off in heavy seas and made a further reconnaissance, maintaining wireless contact with *Hermes*, until forced to return after half an hour by dense fog. Two days later the heavy seas proved too much for the Short's undercarriage and the aircraft had to be hoisted inboard for repairs after damage sustained in a rough landing. No. 81 was airworthy and seaworthy again next day, however.

On August 1, 1913, Short No. 81 took off from Great Yarmouth at 9 a.m. on a reconnaissance flight and flew for some 65 miles without sighting the Blue force. The aircraft was flown by Cdr. Samson and the observer was Lt. Fitzmaurice, who sent W/T signals throughout the flight. The Short had just turned back towards Yarmouth when a part of the engine cowling became loose and sheared through four ignition wires. The engine stopped, and Samson was obliged to alight; fortunately the aircraft was within sight of the *Clara Mennig*, a German timber ship bound for Tilbury. In the emergency landing No. 81's undercarriage was smashed and the lower mainplane and tail unit were damaged. The crew of the *Clara Mennig* came to the rescue and hoisted the seaplane on to their ship's poop. On the cessation of Fitzmaurice's W/T signals it was realized by those aboard *Hermes* that the Short might have been forced down. The probable position of the aircraft, calculated from the W/T signals which had been received, was plotted (and later proved to have been within two miles of where the Short had come down). H.M.S. *Mermaid* was ordered to search for the seaplane, and *Hermes* put to sea as soon as she raised steam. While on her way to the estimated position of No. 81, *Mermaid* met the *Clara Mennig*, and the damaged machine was ultimately transferred to *Hermes*.

The sister aircraft to this first folding-wing seaplane, No. 82, was in service in 1914, and in the summer of that year was used to make the first air search for an overdue submarine, the A.7.

These 160 h.p. Shorts clearly proved the case for folding wings, and construction of further seaplanes embodying the device was undertaken: it appears that at least seven later machines were built. Of these, the precise form of Nos. 89, 90 and 186 is not known, but all are believed to have been 160 h.p. Gnôme-Shorts. The best-known Short Folders, as the aircraft were popularly called, were the four numbered 119-122, and they differed from Nos. 81 and 82 in having three-bay bracing, a larger low-aspect-ratio fin with the curved leading edge which was to characterize so many later Shorts, and modified strut arrangements on the floats. The wings of the "production" aircraft could be folded from the cockpit, and there was no fairing behind the rear cockpit as on the earlier Folders.

The later Folders were in service by the early summer of 1914, and several were present at the Naval Review in July.

It was after the 1914 Naval Review that Short Brothers made their first acquaintance with torpedo-carrying aircraft, and their experience was gained with a modified Folder seaplane.

It appears that the word "torpedo" was first applied to an engine of war in the year 1805, when it was used by Robert Fulton as a name for his idea of exploding a charge of gunpowder under water in contact with the hull of a ship. The idea was indisputably good, but the methods of conveying the charge to its target go little farther than placing the gunpowder on a kind of raft and launching it at what was hoped to be a suitable point whence the tide or current would carry it to its objective. A later and seemingly suicidal means of delivering the charge was the outrigger method. The torpedo-boat was fitted in the bows with a 30ft spar which could be run out and lowered: this spar bore the charge (two 16½-lb tins of wet guncotton primed with 2½ lb of dry guncotton). The torpedo-boat was required to approach its target, lower its charge to a depth of some eight feet and press it against the enemy hull "until the spar creaked audibly"; the charge was then fired. Apart altogether from the extreme likelihood of being sunk by the enemy long before it could bring its Heath Robinson device into position, the torpedo-boat stood in the liveliest danger of being literally hoisted with (or, more accurately, sunk by) its own petard. Yet all picket boats and steam pinnaces of the Royal Navy up to about 1900 were fitted with the necessary mechanism for deploying outrigger torpedoes.

Experiments with locomotive or automobile torpedoes had begun about the middle of the nineteenth century. Some were electrically driven and steered, and were connected to the launching point by fine wires which unwound from drums as the torpedo ran; another type was propelled by a flywheel which had to be mechanically spun by an auxiliary engine before launching. In 1862, however, a Scot named Robert Whitehead perfected his self-propelling floating torpedo. Driven by a compressed-air motor, it had a speed of 5 kt; weight was 300 lb, which included the 18 lb charge of dynamite.

The locomotive torpedo found its way into the navies of the world, and the first to be discharged from a submerged tube in a submarine running under water was fired by Capt. Murray F. Sueter (now Rear Admiral Sir Murray Sueter, C.B., R.N., Retd.).

On May 7, 1909, the Admiralty accepted the tender of Vickers, Son and Maxim for the construction of No. 1 Rigid Airship, better known as the *Mayfly*. It is not without interest to note that the cover, gas-bags and some other details for the airship were supplied by Short Brothers. A special section of the Admiralty, headed by Capt. Sueter, was set up to assist and advise on the construction of the airship, which was built in great secrecy at Barrow-in-Furness. While the airship was under construction, Captain Sueter, Lt. Neville Usborne, Lt. L'Estrange Malone and Lt. D. H. Hyde-Thomson from time to time discussed the possibility of dropping locomotive torpedoes from all types of aircraft. That they were not alone in their ideas was proved in 1911, when an Italian officer, Capt. Guidoni, took off in an 80 h.p. Farman aircraft carrying a small torpedo of 352 lb and successfully dropped the missile while airborne. In the following year Admiral Fiske of

*"*The Story of a North Sea Air Station,*" by C. F. Snowden Gamble, page 86.*

THE SHORT SEAPLANES . . .

the American navy advocated the use of seaplanes or torpedo-carriers, but it appears that no experiments were conducted.

At the time of the preliminary discussions between the British officers, Lt. Hyde-Thomson was in the process of qualifying as a torpedo officer in H.M.S. *Vernon*. When he had qualified as a torpedo-lieutenant he submitted a paper on torpedo aircraft, enclosing sketches to illustrate his ideas. Captain Sueter forwarded the paper under cover of a request that Hyde-Thomson be attached to the Naval Wing of the R.F.C. in order to develop his ideas.

In 1913 a design, presumably for a practical method of carrying and dropping a torpedo from an aircraft, was prepared by an Admiralty draughtsman named Bowden. Capt. Sueter called in Mr. T. O. M. Sopwith and asked him to consider the matter and produce a working device to achieve the desired object.

At the present day, confusion exists as to which British aircraft was the first to fly with and drop a torpedo. Much of the confusion is probably of relatively recent origin and attributable to misinterpretation of surviving documents. In 1918, A.P.134, *The History of the Development of Torpedo Aircraft*, was written. It was so much closer to the events it describes that more reliance can probably be placed on the information it contains than on accounts written, some of them from memory, in later years. It says:—

"Subsequently, Mr. Sopwith was sent for. He was asked to consider the matter and produce a practical proposal. He constructed two aircraft—one, a machine which was not intended to get off the water (a fast skimmer for preliminary experiments); and the other, a machine which just succeeded in lifting the torpedo, but was very heavily loaded.

"Towards the end of 1913 our first flight with a 14-inch torpedo was carried out at Calshot, using a 200 h.p. Sopwith Canton-Unné seaplane.

"Eventually, in September 1913, our first special seaplane for torpedo carrying was ordered. This was to carry the 14-inch torpedo."

This leaves little doubt that the first British aircraft to leave the water with a torpedo was the big Sopwith Type C seaplane, which was powered by a 200 h.p. Salmson (Canton-Unné) radial engine driving its propeller by an extension shaft in order to clear the nose of the torpedo. There is, however, no record of the Sopwith seaplane dropping its torpedo while in flight. Capt. Sueter and Lt. Hyde-Thomson took out a patent, No. 6938, to cover their designs for a torpedo-carrying seaplane. It was dated March 19, 1914, and contains diagrams showing two alternative methods of carrying the torpedo on the aircraft. Two of the diagrams clearly depict the Sopwith seaplane; the others could have been intended to represent a rotary-powered Short, generally of the Type 74 or Folder type, but shown with a remarkably tall undercarriage designed to enable the torpedo to be carried below the lowest point of the propeller disc of rotation.

The date of that patent is of some interest, for the first successful torpedo drop from a British aircraft was not made until the week before war broke out. The torpedo experiments had not escaped the attention of the First Lord of the Admiralty, Mr. Winston Churchill. Immediately after the review of the Fleet in July 1914 he visited Calshot air station. The Archduke Francis Ferdinand of Austria and his consort had been assassinated in Sarajevo three weeks earlier and Europe was moving ineluctably towards war; it was therefore only natural that Mr. Churchill should wish to see the torpedo experiments speeded up.

Commanding Calshot air station at that time was Sqn. Cdr. A. M. Longmore (now Air Chief Marshal Sir Arthur Longmore, G.C.B., D.S.O.), and he has recorded his response to Mr. Churchill in his book, *From Sea to Sky*:—

"I told him that if I could retain a certain Short 160 Gnôme seaplane, I would undertake within a short time to carry and successfully release a 14-inch torpedo which weighed some 900 pounds. The retention of the Short was agreed and on July 28th I succeeded in getting this machine off the water with the torpedo slung below and in launching it for its run. It all worked well but, of course, it was a "stunt."

"No technical expert could pass the factor of safety of the machine so loaded, petrol was only sufficient for about half an hour and there was no passenger carried."

Mr. Hugh Oswald Short has also related how he was called to the Admiralty, told of the requirement, and asked whether a standard Short seaplane could take off with a torpedo. He said that he thought it would, but wished to consult his brother. Horace Short set to work with typical energy: he prepared drawings in an amazingly short space of time, and modified cross-bars for the Short's floats were made that night.

It is important to note that Sqn. Cdr. Longmore used one of the 160 h.p. Shorts for the successful torpedo drop—almost certainly one of the three-bay Folders and not, as has been erroneously represented and illustrated in more than one place, the Short (100 h.p.) seaplane No. 74. The torpedo was a 14-inch missile weighing 810 lb, and Lt. Hyde-Thomson played a leading part.

The experiments were continued during August 1914, and a few more Short Folders were modified to carry torpedoes. The early seaplane-carriers *Empress*, *Engadine* and *Riviera* were produced by hurriedly modifying three cross-Channel steamers belonging to the South Eastern and Chatham Railway Co.; *Engadine* and *Riviera* were specifically intended to provide means of taking torpedo-carrying aircraft out into the North Sea, and three 160 h.p. Shorts of the *Engadine's* complement were modified to carry torpedoes. These Shorts were never used as torpedo-droppers, however, largely because operational requirements kept the carrier vessels employed on other duties. Only one torpedo attack was contemplated but it did not in fact take place.

Three Short Folders went to Africa early in 1915 to assist naval efforts to cripple the German light cruiser *Königsberg*, which was then lying in the Rufiji delta. First air reconnaissances had been made by a 90 h.p. Curtiss flying boat, originally the property of Mr. Gerard Hudson, a Durban mining engineer. The Curtiss was wrecked; and two Sopwith 807s which arrived at Niororo Island in February 1915 proved to be incapable of doing the necessary work. The three Shorts arrived at Durban in March aboard the armed liner *Laconia*, and they reached Niororo Island on April 23. The ageing Folders made several reconnaissances, but conditions were too trying for them and they were replaced in June by two Henri Farman F.27s and two Caudron G.IIIs.

In 1913, Short Brothers built a seaplane to a specific order from Mr. Frank McClean. He wished to tour Egypt by air, and required a large and powerful aircraft which could take off from and alight on the River Nile. The seaplane which was designed by Horace Short to meet this specification was a large pusher biplane powered by a 160 h.p. Gnôme rotary engine. It owed a good deal to the developed S.38, but was a three-seater with three-bay wings. The extensions of the upper mainplanes were braced by lift struts, and a curious feature was the fitting of small auxiliary inboard ailerons in line with the second pair of interplane struts on each side. The small forward elevator perched on the prow of the nacelle was reminiscent of the S.38. The main floats of the undercarriage were of the wooden pontoon type, and the fitting of twin tail floats obviated the need for wing-tip floats.

The big pusher seaplane bore the Short works number S.70, and was completed late in 1913. On November 19 it was flown at Eastchurch with five men on board: Mr. F. K. McClean, Cdr. Samson, R.N., Lt. I. T. Courtney, R.N., Mr. Alec Ogilvie and Mr. Horace Short. The S.70 was shipped to Egypt and re-erected at Alexandria. It began its Egyptian journey on January 3, 1914, when it flew the 160 miles to Cairo in 2 hr 55 min; its crew consisted of Mr. McClean, Mr. Ogilvie, and their mechanic, Mr. A. Smith. The tour was not a wholly resounding success, for engine trouble was experienced thirteen times and the floats were damaged three times. Khartoum was reached on March 23, and the S.70 was then dismantled and shipped back to England after covering some 1,400 miles.

(*To be continued*)

HUNTER RECORDS CONFIRMED

ON December 3 the Royal Aero Club announced that the Fédération Aéronautique Internationale had confirmed the two point-to-point records set up by Mr. A. W. Bedford, A.F.C., and Mr. Frank Murphy, D.F.C., pilot and navigator respectively of the Hawker Hunter T.7 which flew from London to Rome on October 20 and back on October 25. Times and speeds were: London to Rome, 1 hr, 34 min, 38.5 sec (566.1 m.p.h.); Rome to London, 1 hr, 40 min, 9.7 sec (533.93 m.p.h.).

AUTOMATION AND MANAGEMENT

IN the 1957 programme of courses organized by the Sundridge Park Management Centre, Bromley, Kent, three-day courses on *The Impact of Computers and Automation on Management* will be given on January 28-30, March 18-20 and June 12-14. In these courses the practical, technical and organization problems in devising and handling control data and setting up standards of performance are to be reviewed, and the economic and human problems are also to be studied.

Three-week courses on *Measurements for Management* will also be held at frequent intervals during the year, and a work study conference will take place on April 15-17. Further details of planned and proposed residential courses are obtainable from the director of the Centre, Mr. J. V. Connolly, B.E., F.R.Ae.S., M.I.Prod.E.

MORE CZECH RECORDS

THE establishment of two new speed records over a 2,000 km closed circuit by Lubomir Stastny of the Pardubice regional aero club was recently reported from Czechoslovakia. Flying a Sokol aircraft in the C.1b category (500-1,000 kg), Stastny achieved an average speed of 279.5 km/hr (174 m.p.h.); and later, at a weight of 1,014 kg, the machine was flown at 281.1 km/hr (175 m.p.h.)—a new class C.1c record—over the same course.

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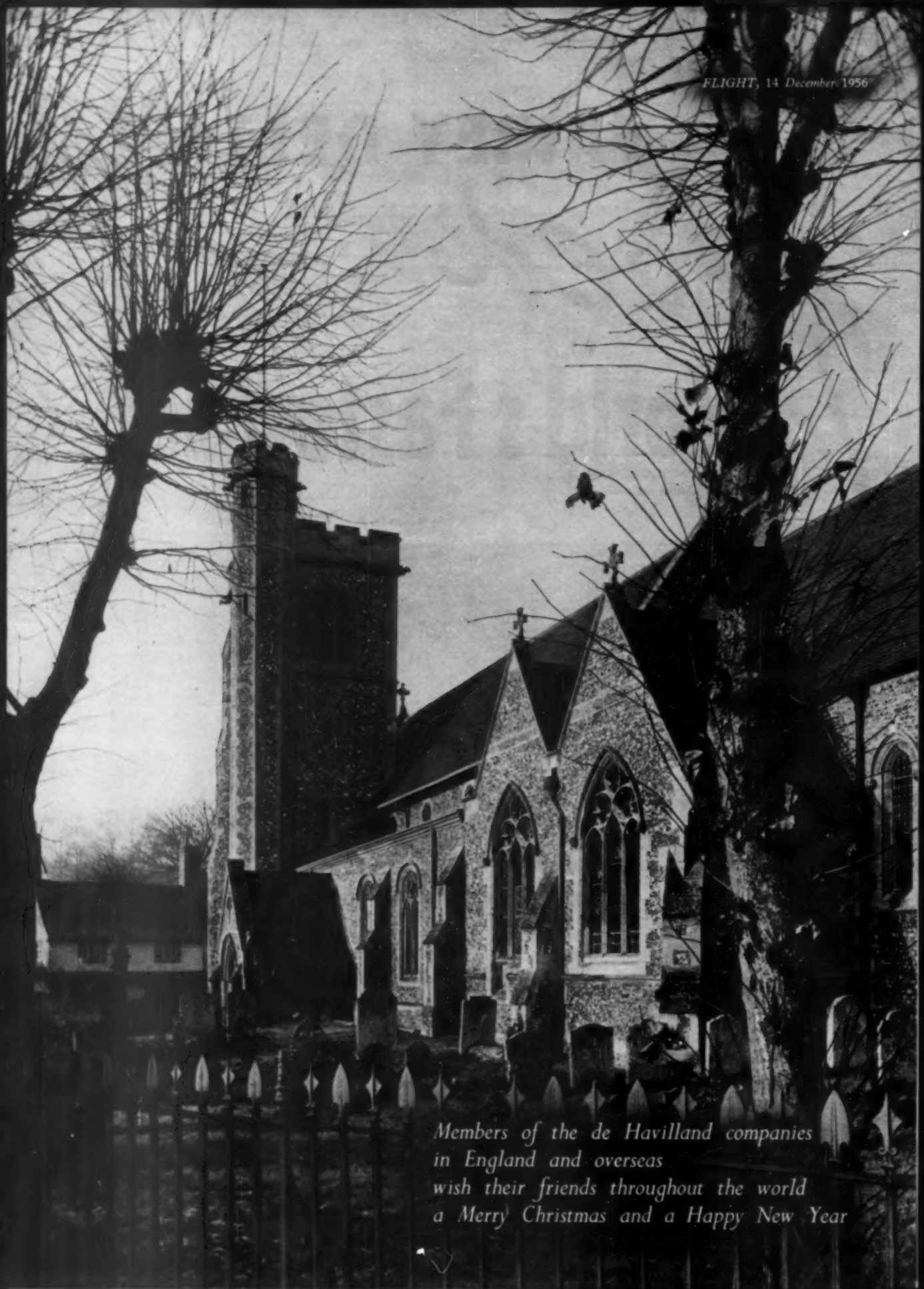

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West Country Aviation

Commentary on a Tour

By DAVID F. OGILVY

An Autocrat of Exeter Aero Club outside the terminal building. Vampires and Mosquitoes are also based at Exeter.

THE flying rates quoted in this article are those prevailing at the time of the author's recent visits. The extent to which club flying charges in general will be affected by the petrol-price increase is still uncertain as we go to press; a reference to current discussions appears on p. 944.

THERE are many of us who deplore the recent closing of several well-known aerodromes in the London area; but although Hanworth, Heston, Redhill, Fairlop, Broxbourne and possibly some others now accommodate houses or gravel pits instead of aeroplanes, there remain even today sufficient ports of call to satisfy the needs of most of us. It is not so in the West Country, for Devon offers facilities only at Exeter and Plymouth, with restricted use of Chivenor, while Cornwall boasts only the over-water jump-off point at Land's End, St. Just, and, seemingly in the midst of the Atlantic, St. Mary's Airport on the Scillies.

Nevertheless, despite the virtual absence of aerodromes, there is no shortage of activity or enthusiasm, especially when we realize that neither county can claim over-population. After all, Exeter and Plymouth are the only towns of any real numerical significance and each has its own airport, so we can hardly expect (nor can demand warrant) anything more. Although the two are very different in size and potential, each offers flying club and charter facilities and accommodation for private owners, each has a contract for the maintenance or operation of Service aircraft and the same parent organization is responsible for their mutual management, with R. J. B. Pearse, O.B.E., A.F.C., as the party primarily responsible for their success.

The traveller to the west will meet Exeter first, and he may well be surprised to find a comparatively large aerodrome with the familiar Service triangular pattern of three runways; and as the longest of these, 27/09, is 2,040 yd in length there are very few aircraft that cannot be accommodated with relative ease. Not that this abundance of tarmac is wasted or merely comes into occasional use when the odd visitor of heavier calibre arrives: despite Exeter's essentially civilian status a first impression of the dispersals round the hangar can temporarily transport one to an operational station of a few years ago, with a host of Vampires at one end and Mosquitoes at the other. Yet there is not one Service pilot on the camp!

The people whose good fortune it is to fly these machines are employed by Exeter Airport, Ltd., as the operators of No. 3/4 Civilian Anti-Aircraft Co-Operation Unit. Although security restrictions prevent mention of details, it may be said that the flying carried out includes calibration, towing and other duties for all three Services. Until 1951 most of the work was performed by a squadron of Spitfires from Chivenor, but in that year the C.A.A.C.U. was formed and took over the task with Beaufighters, Spitfires and Oxfords. The Beaus gave way to Mossies more than a couple of years ago; and now even the Oxfords have handed in their resignations, to be replaced by Anson 19s. The last four Spit. 16s were retained for as long as possible and their disappearance was as recent as last June. However, they are still making public appearances on the screen, for they are to be seen flying in a number of sequences in *Reach For the Sky*.

It is the frequent fate of famous Service aircraft to be relegated to second-line duties, and although the old regular squadron crests still appearing on some of the Vampire F.B.5s must have a slightly heart-rending effect, it cannot be such a sore sight as that of a Sywell-converted Mosquito T.T.35 wasting the power of its Merlins in a private thrust/drag war with a large and ungainly gunnery drogue. Nevertheless, it is pleasant to see the machine still very much alive, and once the "sock" has been released the old dear is just the same as ever; however menial her task, nothing can alter that nostalgic over-the-fence crackle.

Although military aviation of this type possesses a spark of power and fury that makes itself felt in a peculiarly indescribable manner to all who have been Service pilots, it is the purely civil side that must present a greater factor of interest for practical aviators. For the benefit of just such people Exeter Airport was opened in 1937, then boasting but 96 acres of land bought for the purpose by the city. Now three times larger in overall area, it is still municipally owned, but it has not yet been derequisitioned by the Air Ministry; however, its operation is in the hands of Exeter Airport, Ltd., who provide control facilities, a terminal building, maintenance personnel, and a flying club.

In addition to W/C. Pearse, who as managing director of the operating company serves also as airport manager, several other people keep things running smoothly. Now about to emigrate to Africa, John Bennett has been the club's C.F.I. since 1951 and with a small fleet of two Autocrats and a Tiger Moth has maintained a stable level of hourage and utilization. A total of 1,036 hours was flown in 1954, while last year's figure was 1,040, and 1956 has produced improved results. C. E. K. Foster acts as chief engineer of all maintenance work carried out on the airport, but the nursing of club and private aeroplanes, of which there are but two, Autocar and a Gemini, is in the hands of J. Lindores. Last, but certainly not least, is Miss D. I. Perry, whose official status is that of administrative assistant, though in practice she attends to everything from wages to C.A.A.C.U. statistics and club secretarial work to staff appointments.

Apart from flying, the club offers good sporting facilities and claims an excellent squash court, while a tennis court is now being prepared. Of the 265 members, for whom the annual subscription is £3 3s regardless of category, about 100 are not active aviators;

Plymouth Aero Club aircraft fleet, instructors and some of the members. In front of the Gemini are instructors K. P. H. Cleife, W. H. W. Lucas (chief flying instructor), R. A. Gliddon, L. E. J. Prout.

Part of St. Mary's, the largest of the Scilly Isles, showing the harbour and Hugh Town. The airfield (not shown) lies on the main part of the island, to the left of the narrow neck of land.

WEST COUNTRY AVIATION . . .

but for those who are, aircraft can be hired at £3 7s 6d per hour dual or solo.

Numerous charter companies use Exeter, and among recent cargoes handled has been a ship's rotor weighing 4 tons 4 cwt. This was loaded aboard a Bristol Freighter and taken to the rescue of a stranded vessel at Marseilles. More recently, some radio masts for a transmitter were flown to Germany in a York. Of the more regular traffic, Jersey Airlines operate Herons on a scheduled service through the Channel Isles to Paris, and on this route about 8,000 passengers were carried between April and the end of August this year.

Plymouth presents a very different picture. At first sight it appears as a remarkably small grass airfield on rather undulating territory, but in practice it is a far better proposition than initial contact suggests, for the longest run, 24/06, is in fact 1,062 yd from hedge to hedge, and it can all be used.

Here we find W. H. W. Lucas as airport manager, a position to which he has recently and deservedly been promoted, for until W/C. Parkhouse retired from the management of Exeter, Plymouth was W/C. Pearse's territory and Mr. Lucas was his right-hand man; since this, Mr. Cleife has been brought in as No. 2.

The main activity at Plymouth is club work, for which a fleet of four Tiger Moths, an Autocrat, a Messenger and a Gemini is maintained. Some army co-operation work helps to keep the Gemini occupied and, in addition, the aircraft completes its fair share of light charter duties. As a subsidized extra, the Tigers earn a spot of overtime fuel and oil by taking midshipmen from the Royal Naval College at Dartmouth on flight familiarization trips, which seems to be a practical and economic method of instilling air sense and air mindedness into some of our Naval officers of the future.

Subscription rates for the 300 members, and flying fees for the Tigers and Auster are the same as for the club's counterpart at Exeter, i.e., £3 3s a year and £3 7s 6d per hour respectively, while the Messenger comes in at £4 10s and the Gemini at £6 per hour. In the year ended September 30, 1955, these aircraft flew a total of 1,996 hours, whilst the same period in this club year showed an increase of nearly 300 hours.

The amount of work carried out for the Services is small by comparison with Exeter, but it includes the maintenance of the aircraft operated by a Group Communications Flight, and also a pair of Royal Naval Tiger Moths used in conjunction with the Club machines to fly the midshipmen from Dartmouth. All maintenance of civil and service aeroplanes is carried out by a small hangar staff, but by efficient organization these engineers are able to cope with the entire commitment, including C.s of A. and major overhauls.

If we travel farther westward from the Exeter/Plymouth syndicate, we have only Land's End, St. Just, as a permissible civil port of call—and port of call it is, for it serves solely as a stepping-stone for the route to the Isles of Scilly and can claim no centre of population to attract trade or custom in its own right. During the dreary months of the winter it houses the lone Rapide that plods periodically to and from St. Mary's Airport, and while in the summer season this service is duplicated there is little else to attract attention.

The M.T.C.A. controller listens on the mutual Land's End/Scillies frequency of 118.1 Mc/s; and, in addition to aircraft usage, communication regarding flight times and weather is carried out through this ground-to-ground V.H.F. medium. Any visiting club or private pilot without radio is clocked when setting course overhead and is timed on his route across the water.

The flight to the Scillies can be uneventful and sufficiently straightforward in clear weather, but under some (and unfortunately frequent) meteorological circumstances both ends of the route can become rapidly and wholly "clamped" with rolling sea mist. The transition from V.F.R. to I.F.R. often takes only two or three minutes, and when this occurs at the two aerodromes simultaneously life can be more than a trifle hectic. Even the B.E.A. Rapides then operate on a minute-to-minute basis, leaping off when temporary clearances occur. The islands boast a V.H.F. homer, but no aids are available at Land's End.

St. Mary's is the largest of the islands and appears near the left of the group when approached on the track from the mainland. The sight of the aerodrome on the Scillies is comforting in thought but not in basic nature of size or layout. The main "instrument runway" 15/33 is 624 yd in length, and the others, 09/27 and 17/35, are 563 and 544 yd respectively. These figures are more frightening on paper than in practice, for the centre of the field is a hillock, and if a slow and low approach is made, with an early touch-down, the natural braking effect of this undulation brings one to a halt before starting to roll down the other side. Similarly, on take-off, the initially lethargic start and fear of failure to get off is more than compensated when the ground falls away from under the wheels on the second half. This is borne out when we say that we have taken out a nearly fully-laden Cirrus-Gemini without much more than the usual degree of pre-take-off trepidation!

Although the two western counties boast a number of R.A.F. and R.N. aerodromes that could be used in emergency, a return flight *via* the northern coast demands a leg of 124 miles to Chivenor which, although Service-owned and operated, is one of very few active jet stations whose controlling powers are not averse to disciplined and pre-arranged visits by private aeroplanes. As we passed between the Maritime Reconnaissance School at St. Mawgan and the Exeter C.A.A.C.U., the sight of a Lancaster and Mosquito each going about its daily duty was one of refreshing reverence to piston power; but it was a sight that future visitors to such parts will not be able to cherish, for the last Lancaster was being retired on the day that this little tale is being told.

Chivenor is a hive of Vampire T.11s and Hunters, but in a quiet corner we found the premises of Devonair, Ltd., whose main object in life is to operate the Puffin Aero Club. Under the managing directorship of Maurice Looker, the success of this little organization is due entirely to his virtually unaided efforts. Situated in the wilds, with only the handful of inhabitants of Barnstaple at the hangar door, he has built up sufficient work to warrant the regular use of an Auster 5 and a Magister, with a second Maggie expected in service before the start of next season.

Although puffins are known all over the North Devon coast, it is the club's association with Lundy Isle that really determined the choice of name. Mr. Looker has the operating rights into this tiny rock set in the Bristol Channel, and until very recently flew regularly into its rough 250-yd airstrip, delivering the needs of the moment to the score or so inhabitants. However, the islanders have just acquired a small boat for to-and-fro trade, and this, combined with the deterioration of the surface, has virtually killed the aviation requirement. On one or two occasions, when the goods warranted it, a fully-laden Aerovan has managed to squeeze its way in and out.

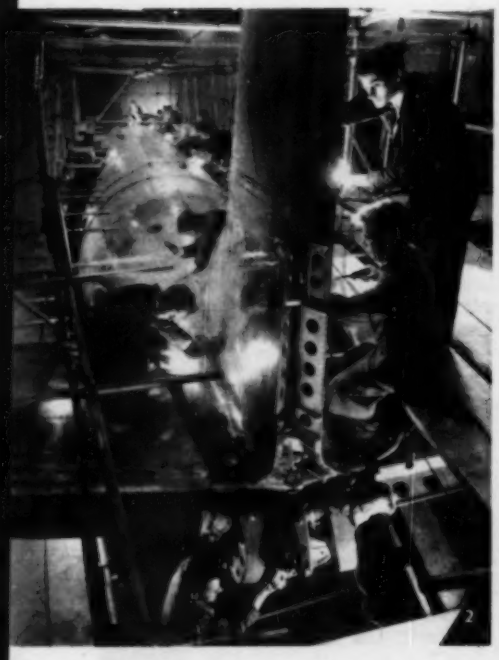
Despite the rural surroundings of Chivenor a club membership of 109 has been attained, and with a block membership from the R.A.F. officers' mess this number reaches 230. A bar has been erected, a dining room quite tastily prepared, toilets installed and all the usual amenities expected of a club are available. An annual subscription of £1 1s is charged whether flying or only social facilities are required.

Flying on the Auster and the Maggie is available at the remarkably reasonable rate of £3 5s per hour for dual and £3 per hour for solo. Although at present all tuition is being carried out by Mr. Looker, he has two candidates undergoing instructors' courses and he hopes that they will shortly be ready to share the load. Mr. Looker has strong views on discipline and believes in firm methods of training. His experiences of converting (or attempting to convert) some of the R.A.F. Hunter pilots back to the flying of light aeroplanes made worth-while listening (and confirmed the opinions of one who once spent over eight hours giving dual to a currently active Meteor driver, who even after that was unfit to be let loose alone in a Magister!).

The aerodromes in Devon and Cornwall, and that on Scillies, have very few unscheduled visitors, so those who do arrive can be assured of welcome. But remember to have some fuel in hand to cope with navigational and meteorological delays; and anyone contemplating Chivenor as a target is advised to take full and appropriate Air Traffic action before setting out, for there is no nearby diversion and unexpected Austers or Tigers are not exactly ideal circuit companions for Hunters or Vampires. However, the aerodromes are there to be used, so why not break from the customary rut and use them?

Gathering Momentum

DE HAVILLAND have four of their United Kingdom factories hard at work on the Comet —Hatfield, Chester, Lostock and Portsmouth. Inside them, as seen in these pictures, are heartening signs of Comet 4 and 4A production swinging ahead towards first deliveries 18 months hence. (Comet 4 fuselage production at Hatfield was illustrated by a photograph last week.)



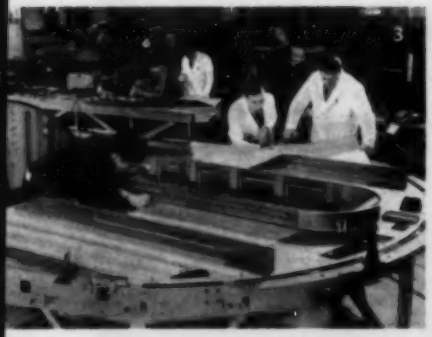
(1) Conversion-work on an R.C.A.F. Comet 1A proceeds at Chester, one of the largest (one million square feet) aircraft factories outside the U.S.A. This work serves as an educational operation for Chester, where Comet 4s and 4As also will be built.

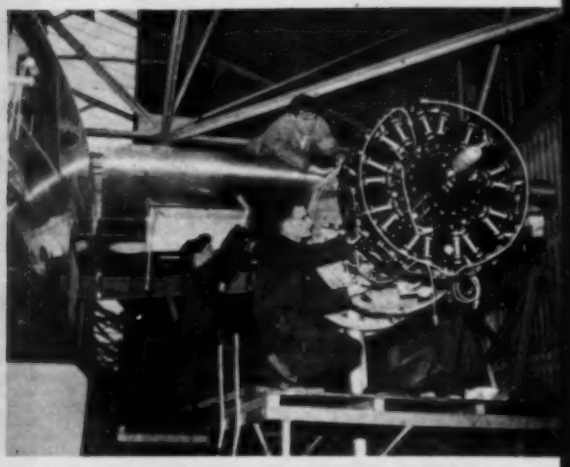
(2) More conversion work being carried out on a Comet 1A at Chester.

(3) Comet 4 and 4A fuselage bulkheads being assembled at the Portsmouth factory.

(4) Main undercarriage forgings for the Comet 4 and 4A at Lostock, Lancashire, where complete fabrication of the undercarriage assembly is performed.

(5) Comet 4 and 4A wing spar-webs (through which pass the engine intakes and jet pipes) being milled from the solid billet. This is a newly-adopted process, replacing previous assembly of the spar-web from 20 separate components.





HOME OF THE PIONEERS

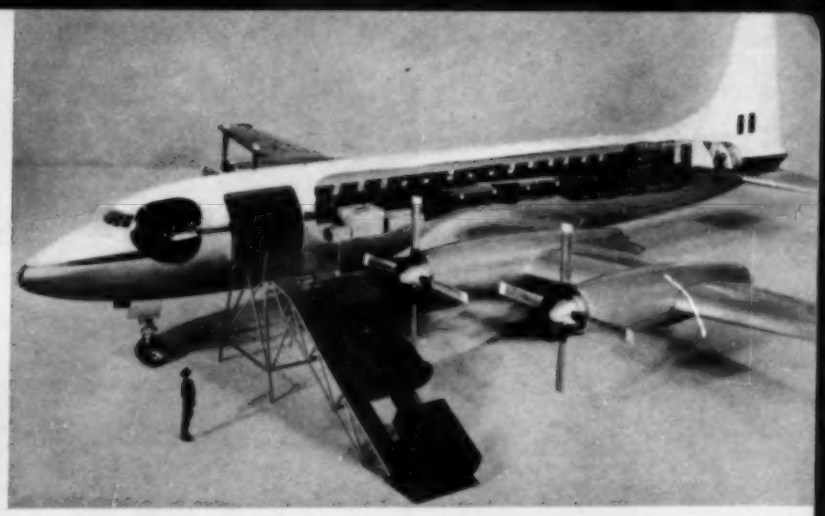
SOME of the advantages of a good home are apparent in the workmanship and short-field performance of the Prestwick Pioneer family of aircraft, the second of which—the Twin Pioneer—recently received its Certificate of Airworthiness. The main offices of Scottish Aviation—the Pioneer's manufacturers—are in the fine building at Prestwick seen below. It was originally built as the Palace of Engineering for the Bellahouston Empire Exhibition in 1938.

Glimpses of Twin Pioneer manufacture are shown above. At right, control runs to the port Alvis Leonides are being installed and, on the left, with propellers and most of the cowlings in place, two aircraft reach the final assembly stage.

By building for a highly specialized market, Scotland's aviation industry—after a late start—has good hopes of breaking into the business on a substantial scale. Each version of the Pioneer has been designed to bring modern transport to out-of-the-way places where elaborate landing grounds cannot be constructed, and rugged construction and specialized aerodynamic features were adopted with this in view.

Scottish Aviation's next venture, timed for the early sixties, is to be a Rolls-Royce Dart-powered TurboPioneer (a drawing appeared in *Flight* for August 3).

More R.A.F. Britannias

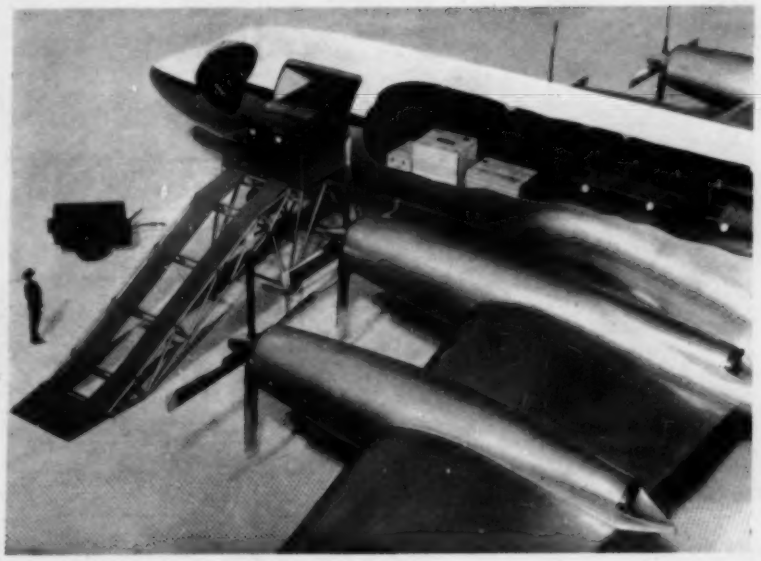


AN order last week from the Ministry of Supply for three more Bristol Britannias for the Royal Air Force brought to ten the number of these transports ordered during that week alone. A few days earlier Northeast Airlines in the United States had finally signed their contract for five, with an option on two more, and Hunting Clan had signed for two, with an option on another. At the time of writing the total number of Britannias sold stands at 65.

The latest machines for the R.A.F. will be Britannia 253s, similar to the ten previously ordered for Transport Command. These aircraft have large freight doors and are equipped to carry either troops or bulky freight. A further three Series 252s were ordered some time ago by the M.o.S. for use on trooping work by British independent operators.

Already B.O.A.C.'s 102s have been engaged on trooping between England and the Mediterranean. Though these have a smaller fuselage than the 250 series, they showed that they could carry twice as many troops on each flight as present R.A.F. transports—and save 35 per cent of the flying time. The 250 will be able to carry as many as 120 men over 3,000 miles non-stop.

It was stated in Parliament recently that "two battalions of the Parachute Regiment and Brigade headquarters were moved to Cyprus by 52 aircraft in 40 hours. A similar move for the same number of troops in 40 hours could be done with five Britannias."



These two views of a part-sectioned model—incidentally a beautifully engineered and finished one—give an idea of the accommodation offered by the Britannia 250 series in a military transport rôle.

B-52 EJECTION SEAT ORDER

THE Weber Aircraft Company of Burbank, California, has received a further contract for over $1m worth of ejection seats for the B-52. The first were ordered in 1951 and the latest incorporate several improvements, particularly designed to increase comfort for large men. More adjustment travel is also incorporated. The B-52's pilot, co-pilot and electronic countermeasures operator have Weber upward ejection seats and the tail gunner has a Weber fixed seat. Navigators eject downwards.

GERMAN APPRAISAL

NEXT month a West German delegation is to visit the United States to make an appraisal of some American aircraft and, after its return, a final selection of intercepters for the German Air Force, whether American, Canadian or British types, will be made.

This news was given when, at Bonn on December 4, the Minister of Defence, Herr Strauss, spoke to the Press about West Germany's rearmament programme. He said that it was intended to spend at least £250m abroad within the next three years. Regarding aircraft, all the main requirements for the tactical air force, which are to be complete by 1958-59, would be met under the U.S. aid programme.

The second phase of air rearmament would be the building up of a "home air defence" force which, while co-operating with NATO, would be regarded by many as the Luftwaffe. For this, according to General Kammhuber (who accompanied the Minister), Germany requires intercepters capable of Mach 2 and able to use runways not more than 1,100 yd in length.

"Excellent British aircraft flying at Mach 2 are being developed," said the General, "and Canadian aircraft available by 1960 will be at least as good as the present British ones."

PIASECKI EXPANSION

THE Piasecki Aircraft Corporation, Philadelphia, has recently extended its facilities by acquiring the 330-acre site, plant and other physical assets of the aircraft division of the Bellanca Corporation at New Castle, Delaware. Negotiations have taken two months and the price involved is $1,325,000 (about £473,141).

Mr. Frank N. Piasecki, president of the Piasecki Corporation, said that this addition of the New Castle plant, fully equipped with aircraft manufacturing machinery in four brick buildings and high bay hangars, would add 258,000 sq ft to the company's present facilities. The newly acquired site includes a 3,500ft runway. Piasecki Aircraft is at present engaged on 12 contracts for the U.S. Army and Navy, including a v.t.o. design for the latter. The company has no connection with Vertol Aircraft, which is the present title of Mr. Piasecki's original enterprise.

FOR LOVERS OF SAIL

ALL lovers of the sea, and particularly those interested in the sailing of large or small craft, will find something to their taste in the *Yachting World Annual 1957*. This contains more general reading than ever before, with articles by experts in every aspect of yachting and sailing. Adlard Coles describes one of his favourite cruising grounds; Dudley Pope writes on the great Sail Training-ship Race; Ian Proctor, an authority on dinghies, discusses developments in the small-boat world. In addition to articles by these and many other expert writers, there is a design section which contains plans, photographs and descriptions of more than fifty yachts of all types.

Yachting World Annual 1957—which would make an excellent Christmas gift for yachtsmen or sea-loving landlubbers—is published by *Yachting World*, Dorset House, Stamford Street, London, S.E.1, at 35s (by post, 36s 5d).

SWIFT AS AN ARROW

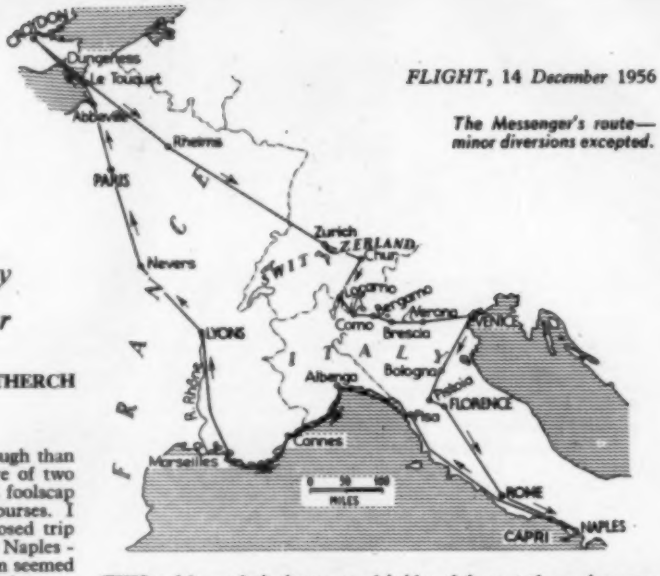
THE fastest low-level reconnaissance aircraft employed by any air force is the Vickers-Supermarine Swift F.R.5, subject of a leading article in this issue. Two squadrons—Nos. 2 and 79—are now equipped with this Rolls-Royce Avon-powered single seater, and both are components of the 2nd Allied Tactical Air Force, operating in Germany. These very impressive pictures show machines of No. 79 Squadron, which is commanded by S/L. N. K. McCallum, D.F.C., A.F.C., and has as its distinctive marking a red arrow, seen emblazoned on the fuselage sides. Below, a Swift is glimpsed as it flashes across the Möhne Dam—so well remembered by the R.A.F. from more troubled times; and at lower right four machines are grouped in a workmanlike echelon. The fighter/reconnaissance Swift carries vertical and oblique cameras and is armed with two 30 mm Aden guns.

CROYDON TO CAPRI

—and Back: a Holiday Journey by Four in a Miles Messenger

Part I

By T. G. PRYTHERCH



The Messenger's route—minor diversions excepted.

THIS article, we feel, gives a very fair idea of the sort of experiences—of weather, scenery, people and (occasionally) the altogether unexpected—which a light-aircraft user may encounter if he ventures on a Continental tour. The Miles Messenger (Cirrus Major 3) carried four people: the author, who recently founded the Puss Moth Flying Club at Croydon, and who in pre-war days held an Autogiro licence; Mr. E. M. Bell, A.R.Ae.S., a liaison engineer on Viscount construction, and designer of an ultra-light soon to be built; Mr. W. Lofting, an aircraft radio specialist at Vickers-Armstrongs; and Mr. N. Bennett, a recording engineer and radio "ham."

D-DAY plans could scarcely have been more thorough than those we made for our journey. An expenditure of two pounds ten shillings on maps was a prelude to a foolscap sheet full of place names, statute miles and magnetic courses. I had not flown further than Paris before, and the proposed trip Croydon - Rheims - Zurich - Locarno - Venice - Rome - Naples - Pisa - Albenga - Cannes - Lyons - Le Touquet - Croydon seemed as formidable a task as breaking through the sound barrier.

I had enormous faith in the Miles Messenger we hired, and a preliminary flight, four up, convinced me that it had almost a Proctor-like performance combined with take-off and landing characteristics all its own. With 36 gallons of fuel and a six-channel Plessey radio we felt prepared to face anything—though quite late in the arrangements we discovered that our Messenger had been rebuilt with Gemini wings, and the additional 300lb reduced our luggage to the resemblance of a packed lunch each.

After days of indifferent weather August 8 dawned as one of this summer's few good days. After the usual paper work our estimated ten o'clock take-off became eleven. We were off the ground after a ridiculously short run, and set course for Dungeness in brilliant sunshine. The Channel crossing at 5,000ft from Dungeness to Le Touquet was uneventful, and we reset course over Le Touquet for Rheims.

I held a cruising speed of 100 m.p.h., and after two-and-a-half hours we landed at Rheims to refuel. The next stage, to Zurich, was notable for the sensation of height conveyed by clearing the hills near Basle by 800ft at 6,800ft and then being projected, as it were, over a sheer drop into the valley beyond. My first view of the Alps was impressive. What I first dismissed as clouds in the sunshine resolved themselves into majestic snowy peaks which made mankind seem very puny indeed.

Four miles from Klöten, Zurich, I managed to make radio contact, if intermittently, and found it essential on such a busy international airport, where we landed after a Constellation and a Viscount. In deference to the big stuff I obtained radio permission to put down on the short grass strip being used by club aircraft. Radio instructions for taxying to the imposing airport building were most explicit, and we felt quite important as we lined up between a Constellation and a Viscount, watched by large crowds on the three-tier balconies. The landing fee was the equivalent of six shillings and hangarage cost 15s a night.

With five-and-a-half flying hours behind us we enjoyed a good meal in the glass-fronted palace with its background of a moonlit sky, and were oblivious to the cost, which far exceeded a pound sterling apiece. The taxi-driver recommended a good hotel, and at 16s each for bed and breakfast we were satisfied. Our slumbers were cut short by a loud fire-alarm and some church bells at five o'clock. There followed the Continental breakfast of rolls, and then sightseeing and souvenir hunting, capped by a ride on the funicular railway to a hill overlooking Lake Zurich.

After being "clamped" by weather in an Alpine valley: G-AILL on the disused wartime airstrip at Domat-Ems, near Chur.

Next morning we were to encounter our first snag. The club pilots at Zurich were most helpful, but few had flown in the Alps. Those who had done so favoured the crossing of the St. Gotthard Pass, over 9,000ft up. At 11,000 or 12,000ft, they assured us, we should be all right. Then the met. man warned us off—the dreaded south wind in the St. Gotthard Pass, the Föhn, caused sensational down-draughts; and we were to see the wrecked engines of a Twin Navion caught-out in this way, and a hair-raising photograph of a concertina-like Piper Cub. The way we fancied was down the lake to Chur, then *via* Disentis and the Lukmanier Pass. This pass is some 6,500ft high and all we had to locate the turning-off point was a wooden bridge and a monastery.

The mixture control of the Messenger had been disconnected, and we deemed it a prudent move to have this restored immediately. Swiss engineers worked hard for over two hours and installed a neat cockpit control.

The weather man warned us that bad weather was coming in, and that if we did not go that afternoon we should face two or three days' delay. Our midday take-off became 4.50 p.m., but at last we were off down the runway, loaded with all we could carry. I reached 9,000ft at the easterly tip of the lake and gingerly entered the next valley. We were 100ft below the sides and fairly filled the valley, leaving vision ahead and down each side of the nose. I was pondering on the futility of keeping to the right in the valleys when I spotted a Piper Cub over to our left, skimming the peaks. We joined another valley and almost immediately ran into thick haze. This suggested turning back, for the narrowness of the valley left no margin for error. However, we emerged again into clear weather and were now at 9,500ft. We identified Chur, a town of reasonable size, boasting according to the *European Air Touring Guide* an airstrip.

My idea of a monastery is that it should resemble a church, so when we flew over what looked like an hotel with green-tiled roof and white walls, surrounded by houses, we went sailing on. Presently we spotted a lake which was not marked on the map (the half-million map is nigh on hopeless for Alpine flying)—and simultaneously we were confronted by a sheer rock face that towered above us. Large helpings of flap assisted us to turn on a sixpence and we started back toward Zurich, 100 miles away, feeling distinctly frustrated.

We had been so pre-occupied with finding the way (in one place, where the map simplified it to three valleys we found seven, all looking alike) that not until the return did we notice that in the next valley to the west it was as black as night. Upon reaching Chur we were concerned to find that the valley ahead was enjoying a first-class thunderstorm; and although I had a reasonable petrol supply I could not have climbed above the storm to reach Zurich. High winds in a darkened valley lit by vivid lightning flashes made only one course possible. Since the *Air Touring Guide* listed Chur as having an airstrip, I turned

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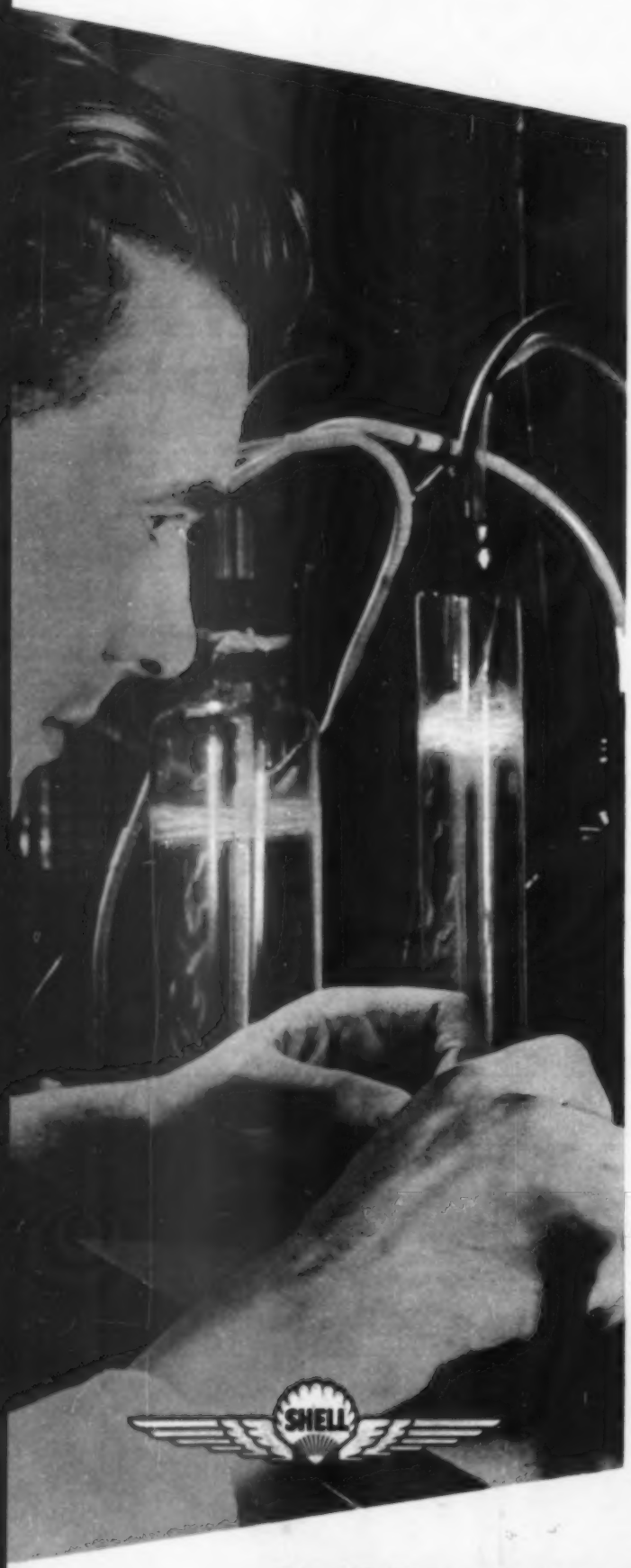

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CROYDON TO CAPRI . . .

The Rheinwaldhorn (11,165ft), photographed from the Messenger at 9,500ft on the leg through the Alps from Chur to Locarno.

round again to look for it. We lost height from 9,000ft to 1,000ft; but that strip was nowhere to be seen. Much of the ground was cultivated, and only small patches broadside-on to the valley presented themselves as landing grounds, with no possibility of take-off.

Keeping a wary eye open for the many power cables, I waggled the wings in the vain hope that somebody could point out the airstrip. But no, we were on our own. I considered one long narrow strip, but it was ringed by tall trees. The next village had a field which, though cut in half by telephone wires, looked unbelievably long. I was mystified by its neglected look, and decided it must be marsh or swamp. Two dummy runs revealed that it was worth a try, so I approached over a power cable and some tall trees and, using brakes, stopped in 30 yards. We were down and in one piece, and in the fading light there even seemed room for a take-off, despite the presence of grass three feet tall.

We had scarcely come to a halt, near a main road, when people came from all directions and we were hard put to it to prevent damage to the aircraft. They were a well-meaning crowd, and a few spoke some English. The stopping cars caused chaos on the road, but we saw no police at any time. I had the greatest thirst I had ever known, and our new friends soon brought us bottles of beer and sandwiches in profusion. In the now-failing light we spelled out, Braille-fashion, the name of the place on the beer bottle—CHUR! Our first positive fix! We were actually at Domat-Ems. We received our second surprise when it transpired that we were on a wartime emergency strip, unused since 1945 and in active course of being measured into plots with hefty stakes and stones like milestones—all invisible in the tall grass.

Of our many new friends Rudy Schaffer, Jack Schneider and Otto Wurth were pilots, but they had had little chance of flying for some time, because the club at Chur had closed down. Transport was provided and Norman Bennett and Bill Lofting were taken to seek accommodation at the local inn. I decided to stay with the aircraft, and Eric Bell and I settled down in splendid isolation in the all-covering darkness. At 11 p.m. we welcomed a cyclist who brought us more beer and sandwiches.

That night we were treated by the elements to a first-class thunderstorm. Lightning danced all round us and torrential rain fell. We pondered on the chances of being struck—the prop pointed upwards like two hands in prayer and we had the aerial sticking up behind us. The cockpit was watertight and we spent the night being rocked and rolled by the wind, with nothing on the clock but 2,000ft on the altimeter. Quite early Bill arrived from the inn on a borrowed bicycle and took over guard duties, while Eric and I accompanied Norman to the inn by taxi for most welcome bacon and eggs.

There was a telephone at the inn, and Zurich Airport had been informed. I was pleased to learn that they themselves had experienced "impossible" weather the previous evening, and that they had congratulated us on a wise alternative. The weather was still poor, with heavy rain and clouds low in the valley, and I enjoyed the opportunity to relax.

That afternoon we taxied the aircraft the length of the field to a sheltered place beside a large barn which would reduce its attraction for every passer-by, as its present place made it a magnet. The taxying process was most enlightening, for we found all the stakes and rocks, and resolved to have a thorough check-up before take-off. Our taxi-path was anything but straight.

Later we returned to the inn, a place with an old-world look outside, but up-to-the-minute electrically inside. We needed petrol, and Rudy offered to bring some in by train. Zurich, however, were alert and Shell telephoned us to ask the quantity of fuel necessary and to inform us that it would leave by road immediately. From 70 miles away it arrived only two hours later, and while I took on 20 gallons from a two-gallon measure through a chamois-leather filter, my three companions left for a motor ride to Chur with Otto Wurth. They were shown the airstrip there, but they expressed great doubt about its size; it certainly would not have been recognized from the air as a strip. Incidentally, our petrol consumption in the mountains had been phenomenal; we had been consuming ten gallons an hour instead of six.

Early that evening our kind friends came to inform us that they had locked the aircraft in the barn, so that we could sleep at the inn that night—a splendid achievement for which I felt more than grateful. In the evening we dined at Rudy's home with Jack Schneider, and Rudy's wife provided a magnificent dinner. We were supplied with excellent maps of our route, with photographs of prominent landmarks, and were given alternative routes which, unfortunately, we could not use because the safe altitudes were beyond our maximum.

The following morning, Sunday, we walked to the field. The clouds were still obscuring the upper valley, but with Rudy, who produced a bundle of home-made flags, we paced out the runway into wind, in the opposite direction to our landing and slightly uphill in places.

We had hardly finished when Norman arrived from the inn with Otto and Jack to say that we should get airborne as soon as possible, for there was good weather to the south. I taxied empty to our pre-arranged mark, loaded up, shook hands with all our friends, and, with the engine at full throttle, released the brakes. We bumped along to the first flag, then to the second, and lined up on the tree. Our rear passengers leaned forward, and within fifty yards of the boundary she came off suddenly and climbed like a lift over the trees and the power cables.

As planned, I turned left at first, then right to go over the town, and a tight climbing turn sent us back towards the field at 4,000ft. I waved, and waggled the wings, to the small knot of people watching us on the field, and we continued the climb at full throttle to 9,200ft. This time the monastery did not elude us, and we turned off to find that the one valley became two a few miles on. A quick consultation over the map sorted it out, and the compass heading of the valley proved a valuable check.

Our maximum altitude was now 8,200ft, maintained by full power but reduced r.p.m. with a little flap and an airspeed of 70 m.p.h. When the valleys joined ours we encountered slight turbulence, but nothing comparable with the Föhn of the St. Gotthard Pass. After rugged peaks, and a glacier, and snow, we turned at right angles into another valley heading south past a rock-face that seemed to look down at us with a sphinx-like expression. I saw two lakes in the distance, and a conference with Eric, who was not expecting them, raised doubts; but uncertainty was soon dispelled by Bill in the rear seat, who at that moment caught sight of the beginning of Lake Maggiore. We were through. How reassuring was the sight of flat land at Locarno! Despite the cold we opened the side windows and indulged in a spate of photography. I lost surplus height by circling over the lake and then we landed in an oven-like Locarno.

Followed the paper work, a telephone call to Rudy back at Domat-Ems, refuelling, and the six-shilling landing fee, and we were ready to go on to Venice. A welcome Coca-Cola and then

CROYDON TO CAPRI . . .

we all four invaded the wrong room before the difference between the words "Signore" and "Signora" on the respective doors dawned on us.

We took off towards the lake and climbed steadily. The mountain came right down to the water, leaving no possible landing space, and where there was the occasional village in near-impossible terrain I made for it. At 4,000ft we flew along south of the mountains past Como, and Bergamo, and Lake Iseo. Now the ground below was a patchwork quilt of cultivated areas, and I felt pleased to see airfields. On a big military aerodrome near Brescia we counted upwards of fifty jets, apparently drawn up on parade. We flew north of Milan but could clearly identify it as a sizeable centre of population. As we crossed Lake Garda, between Brescia and Verona, we had a splendid opportunity to line up on the little finger of land sticking northwards into the lake.

Our complacency suffered somewhat soon afterwards, when we watched a cumulo-nimbus cloud come right down to the deck. We diverted northwards for ten miles and I succeeded in making contact with Venice San Nicolo Airport, whose controller provided us with QDMs in. At Locarno they had told us in an old-fashioned way that the airport officials at Venice were real gentlemen. Emerging from the murk to see the toy town that was Venice, with the airport on the Lido beyond, and with the assuring voice giving QDMs, I was half way to believing them.

Over the airport I watched fascinated as a Dakota landed, sending up clouds of dust, and taking every inch of the very small runway. The wind there is always a beam wind, and the approach over tall buildings almost on the boundary roused in me a great admiration for the Dakota pilots who use the field. We bumped to a stop and back-tracked down the runway on radio instructions. And now I shared the reactions of a woman who encounters another wearing an identical dress—for sitting on the tarmac was another Messenger. It was flown by Mr. Woods of Perth Flying Club, who had avoided the Alps and was now returning *via* Milan.

After seeing Lima Lima lashed down we took the trolleybus to the landing stage and caught the steamer to Venice, a 20-minute trip costing threepence! The hotel situation was desperate, but the manager of the Tres Rosa Hotel, a charming man who spoke perfect English, arranged for private people to take us in, two at one place, and the others elsewhere. For a spotlessly clean double room we paid a thousand lira each a night, about 12s. Reveille was more or less determined by the deep-toned bells of St. Mark's.

With a Continental breakfast inside us and seven shillings the poorer, we admired the splendour of St. Mark's Square which in the glorious sunshine made an unforgettable sight. The English-speaking tour at eighteen shillings was value for money, for one finds that private-venture exploration involves an admission charge at every corner. We were fascinated by the last item on the tour, the glass-blowing factory, where we saw glass in every conceivable shape and colour; the temperature out-of-doors was near 90 deg F and the short visit to the ovens nearly finished us off.

We just had to make a gondola trip by night. Given excellent weather, a moon, the singing that characterizes the canals, and a gondola at thirty shillings an hour, we had the requisite romantic set-up—even if the gondolier did demand two hours' pay for one hour.

In readiness for an 11 a.m. departure we invaded the airport early next morning. Landing and take-off charges were 12s, with an extra 12s for customs. We were becoming used to manual petrol tankers, and before we finished we had all had a hand at the pumps. I found it essential to supervise refuelling, for one can be anything up to two gallons short; equally, it may be right over the top, with the attendant smell of petrol in the cabin.

We took off with our usual foolscap or map-sized weather-information chart. The weather is so wonderful there that they must feel fireproof in their forecasts. We left this delightful airport with the built-in crosswind, whose runway finishes within two yards of the sea, and indulged in a climbing turn that gave us a last glimpse of Venice from 1,000ft as we crossed St. Mark's Square. "Please do not fly over Venice below 300 metres" was the airport's last word.

We flew on towards the Apennines at 4,000ft and the sight of the range of mountains heralded the approach of Bologna. We were a good two miles off track and were tempted to think another town was Bologna, but we soon sorted it out, and admired the city's lovely airport. Once again we followed a valley, this time through the Apennines, and flew into very misty conditions. There were peaks that must have been 7,000ft high, and we met the usual assortment of valleys galore. I climbed to 6,000ft and pressed on, following a compass course that suffered when peaks appeared in our way. The land below occasionally showed signs of life, but there were many barren areas in which (so I have been told) bears and wolves still roam.

Now we were over a large town on low land, complete with a dome which at first sight suggested Florence, but on the friendly-looking airport the name PISTOIA was to be seen. Florence lay just beyond, and we feasted our eyes on this artistic gem of Italy, feeling sorry our time schedule would not permit a stop here. Eric, my navigator-in-chief, will not forget the question which seemed to be ever on my lips, "How high?" accompanied by a pointing finger. But the remainder of the trip to Rome was free of mountaineering, a welcome relief, and we noted with interest an occasional flying-boat base on the lakes over which we passed.

That Rome was near we could tell by the number of large aircraft converging on it. There are at least three aerodromes, and our flight plan was for Urbe, three miles north of the city. Bounded on three sides by the meandering river it looked very attractive, with grass runways clearly marked, but it also appeared completely deserted. I actually spotted a windsock, and it proclaimed that the runway was almost into wind. Approaching over high ground and power cables we found that near the ground the heat and the wind made it a "to me, to you" business; and when we touched down the ground was anything but level.

Our landing brought the place to life. Two jeeps cavorted around, doors and windows opened, and as we approached we were waved in by a good friend (as he turned out to be) who spoke some English following a sojourn in Manchester as a prisoner-of-war. He organized hangar space and transport and would not hear of taking a tip. Incidentally, the hangars were full of Italian and American aircraft, and two Consuls. I appreciated the hangar's light folding aluminium doors, which opened at a touch.

Formalities over, we sped to Rome, where, after a 'phone call, we met friend Peter, son of an English mother and a Swiss father. He spoke perfect English and promised a crowded itinerary on the following day. The first hotel was full, but the second, the Alicorni, fixed us up, and at 16s a night was a marble palace which reminded me of the geological museum at South Kensington. Before dinner we visited St. Peter's, but not before we had been stopped in the street and offered Parker 51 fountain-pens at 15s each.

After the promised day of sightseeing, the details of which must perforce be omitted from this mainly-aviation story, we had dinner in Peter's home, a most enjoyable experience. The flat had a verandah screened above and on each side by a wooden framed structure lined with rushes, and since it was still very hot we welcomed the outdoor setting for the meal. After the usual preliminaries came a local dish of some fame, resembling a folded pancake and containing meat, fish and tomatoes. A local wine picturesquely named *Est, Est, Est* we found delicious. Our evening concluded with some coin-throwing in the well lately made famous in film and song.

(*To be concluded*)

". . . indulged in a climbing turn that gave us a last glimpse of Venice from 1,000ft . . ."

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PART 2: THE MEDIUM-HAUL MARKET

A "FLIGHT" ANALYSIS BY J. M. RAMSDEN AND A. T. PUGH

THE conclusion of Part I of this study was that the world's scheduled airlines, far from having over-ordered, have still to buy a very large amount of capacity if they are to meet the expected demand in 1962. The actual amount was calculated to be 11,000 million tonne-km—which is about 70 per cent of the existing world fleet.

But bare figures of tonne-km are of academic interest only. What the world's dozen major transport manufacturers want to know is: How will these tonne-km be distributed among their aircraft? This question cannot be answered accurately. It requires only a moment's thought to appreciate the futility of attempting to apportion this 11,000 million capacity tonne-km among the 20 types of transport now on the market. Yet it is possible, by careful research, to assess how it may be distributed among the four main route-categories of scheduled air transport —local-service, short-haul, medium-haul, and long-haul.

It is with the medium-haul market—the traffic which is carried over stages of between 500 miles and 1,500 miles—that this part of our analysis is concerned. Will there really be enough business to sustain profitable production of the Comet 4 and 4A, Britannia, Convair 880 Jet-Liner, Vanguard, Caravelle and Electra? (The Viscount and Convair 340/440, being short haulers, do not figure in this study.)

The six manufacturers concerned (de Havilland, Bristol, Convair, Vickers, Sud-Est, Lockheed) are all committed to production orders, and it must be assumed that each is hoping to produce at least 100 aircraft over the next five or six years. Lockheed have of course already contracted to exceed this figure with the Electra (see Table 1), but, judging by the ardour of their present sales and advertising efforts, they hope to sell a great many more aircraft yet. And we have Douglas and Boeing—shrewd marketers both —with serious medium-haul jet contenders (respectively the DC-9 and 727 projects), although neither is yet committed to production.

Of course, even if there is enough business *theoretically* to support all these aircraft, more of it will go to some than it will to others. In other words, in a hard competitive world, even if there is enough business theoretically to justify a given number of producers, some of them are almost bound to fall by the wayside—or at least to effect only meagre sales. Especially if some of the producers already enjoy long traditions in the market.

How much more disappointment there would be if, in the first place, there were not enough potential business theoretically to be shared profitably by all the producers.

We shall assume that the aircraft listed in the table have been designed, and will primarily be bought, for routes of between 500 and 1,500 miles. Some of these aircraft, particularly the turboprops, will have a much wider flexibility of range: but it is assumed that the 500 mile to 1,500 mile band will nevertheless be their main regime.

First we must examine the world's scheduled air traffic to see what proportion of it is carried over 500-mile to 1,500-mile stage-lengths. Our first source of reference is the latest available issue of the I.C.A.O. *Digest of Statistics* (*Traffic Flow*), *March 1954*, a formidable document crammed with data on traffic flow on each stage of flight in scheduled international operations. These data cover *international* operations only—as reported by 30 I.C.A.O. member countries (on Form C of the Organization's air transport reporting circulars) on behalf of 65 airlines.

Each sector lying in the 500-mile to 1,500-mile band has been considered, provided that it is obviously likely to be operated by the new medium-haul transports. Clearly, many long-haul services include sectors which are shorter than the optimum for the long-haul aircraft employed; and the reverse is true of many short-haul sectors. For example, a long-haul service is operated from Paris to Tokyo *via* Rome, Beirut, Karachi and Saigon. Although two of these sectors (Paris-Rome and Rome-Beirut) fall within our medium-range category, none of our medium-haul transports is likely to be used on such a service. Again, a short-haul service is operated from Copenhagen to Istanbul *via* Frankfurt, Munich, Rome and Athens, but although one of these sectors (Rome-Athens) falls within our medium-range category, none of

TABLE I: NEW MEDIUM-HAUL TRANSPORT CAPACITY
Ordered by Scheduled Airlines (correct to December 4, 1956)

	No. on order	Capacity payload (lb × 1,000)	Total cap'cty payload (tonnes)	Block speed (km/hr)	Utilization	Capacity (tonne-km × 1,000,000)
Britannia 100, 300	42	15 × 21 lb 27 × 28 lb	485	490	3,000	715
Vanguard	20	23	208	480	3,000	300
Electra	128	21.6	1,250	480	3,000	1,800
Comet 4, 4a	33	10 × 23 lb 23 × 19 lb	303	600	3,000	545
Caravelle	12	20.5	110	500	3,000	166
Convair 880	40	25	450	690	3,000	910
Douglas DC-9	—	21.3	—	720	—	—
Boeing 727	—	—	—	—	—	—
					Total new capacity	4,436*

* The latest order for five Britannias (Northeast) is not included.

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the new medium-range transports is likely to be used on such an operation. On the other hand, there are many medium-haul services in which one or two of the sectors are either short-haul or long-haul; but clearly the new medium-range transports *would* operate such sectors. Scheduled all-cargo operations were ignored, as were the European medium-haul networks of American operators, and *vice versa*.

The I.C.A.O. *Digest* records the traffic—passengers, freight and mail—carried during one month of the year, and it has been assumed that the annual traffic will be twelve times this total. This of course assumes that seasonal peaks occurring at different times in different parts of the world will, when spread over the whole twelve months, balance one another out. This inevitably does not provide the annual total to such a high order of accuracy as would a month-by-month examination of traffic; but it does provide a near approximation, and hence the general picture which is the intent of this study. It would not in any case be possible to make a month by month examination, because the necessary figures are not available (the I.C.A.O. *Digest* is published every six months, in March and September).

Altogether 310 international sectors were found to lie in the medium-haul band. These cannot all be shown for space reasons, but a sample selection appears in Table 2. The total traffic

TABLE 2: MEDIUM-HAUL SECTOR TRAFFIC
(Sample selection from 310 international sectors)

Sector	Distance (km)	Monthly capacity hauled both ways (see text)			
		Passengers (tonnes)	Cargo (tonnes)	Mail (tonnes)	Total (tonne-km ×1,000)
Copenhagen-Paris ...	1,013	187	36.06	14.08	240.2
Buenos Aires-Rio ...	2,024	64.2	6.027	6.604	155.5
Rome-Tel Aviv ...	2,254	116.3	18.11	4.209	312.0
Singapore-Djakarta	895	179.4	33.17	43.59	230.0
Tangiers-Bordeaux ...	1,104	24.9	7.463	1.341	37.2
Taipei-Tokyo ...	2,188	12.5	6.495	19.28	83.8

Convair 880 Jet-Liner, the only one of the American medium-jet trio so far to be ordered. The engines are General Electric CJ-805s.

hauled on these medium-haul stages during the month considered (March 1954) was found to be 46.67 million tonne-km, representing an approximate annual traffic of 560 million tonne-km—i.e., 32 per cent of total international traffic in the year considered.*

Thus, in that year, 32 per cent of *international* traffic, as opposed to *domestic* traffic, was carried between medium-haul stages. Will this medium-haul percentage remain the same in 1962? About the same proportion of traffic will always wish to fly over 500 to 1,500 mile sectors regardless of the type of equipment used to get it there. This contention is borne out by the fact that, since 1946, despite the steady introduction of larger and longer-range aircraft, the average length of passenger journey has fluctuated by less than six per cent (last year, for the whole world, it was 559 miles). There was a steady fall in average sector length from 1947 to

**Total international traffic in 1954 was 1,750 million tonne-km, a figure computed from the I.A.T.A. "Bulletin" No. 21, plus the individual totals for non-I.A.T.A. airlines given in I.C.A.O. "Digest of Statistics" No. 54, Traffic. As a matter of interest, the figure for I.A.T.A. carriers only was 1,681 million tonne-km.*

Lockheed Electra, the most heavily ordered (128) of the new medium transports. Its turboprops are Allison 501s.

1951, after which it picked up—due, undoubtedly, to the introduction of tourist fares, particularly on the North Atlantic. Tourist traffic is generally heavier on long-haul services, because tourist rates offer better returns to the airlines over longer distances.

The introduction of third-class fares over the North Atlantic in 1958 will almost certainly result in further increases in average journey distance. There are, it seems, no grounds for assuming that medium-haul traffic's share of the world total will rise: on the contrary, it is more likely to give way to long-haul traffic. Any decrease would not be substantial: our guess is two or three per cent. But we have assumed that the medium-haul share of total international traffic in 1962 will remain the same—i.e., 32 per cent.

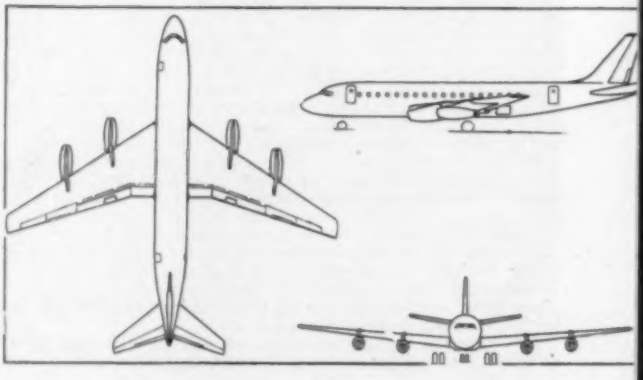
This medium-haul share of international traffic might appear surprisingly low. We must confess that our own eyebrows lifted momentarily at the result of our traffic study. But a cross-check with Tables 2 and 3 of Part 1, which give the capacity of (2) existing fleets and (3) new orders, shows that the medium-haul *capacity* shares of the totals are respectively 35 per cent and 25 per cent.

So much for international traffic, which of course is only one-third of total world traffic. (The actual proportion over the years appears to have remained fairly steady at about 30 to 35 per cent.) The other two-thirds is domestic traffic, of which the majority (80 per cent) is carried in the U.S.A.

What proportion of *domestic* traffic is medium-haul?

We know that the length of the average passenger trip for the whole world—international and domestic—is 559 miles, plus or minus a few per cent. We have been unable to find a reference to the average trip length of the international passenger, or the average trip length of the domestic passenger. But we do know the latter very nearly, because in the U.S.A., which accounts for 80 per cent of the world's domestic traffic, the figure is 550 miles.

Both Douglas and Boeing have been offering junior versions of their big jets (DC-9 and 727) on the medium-haul market—so far without success. Here is a provisional general arrangement of the Douglas DC-9.



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The great new steel mill at Paz del Río—that's where these men are working now. They live in Belencito, so recently a village but now rapidly becoming a big industrial town in the department of Boyacá.

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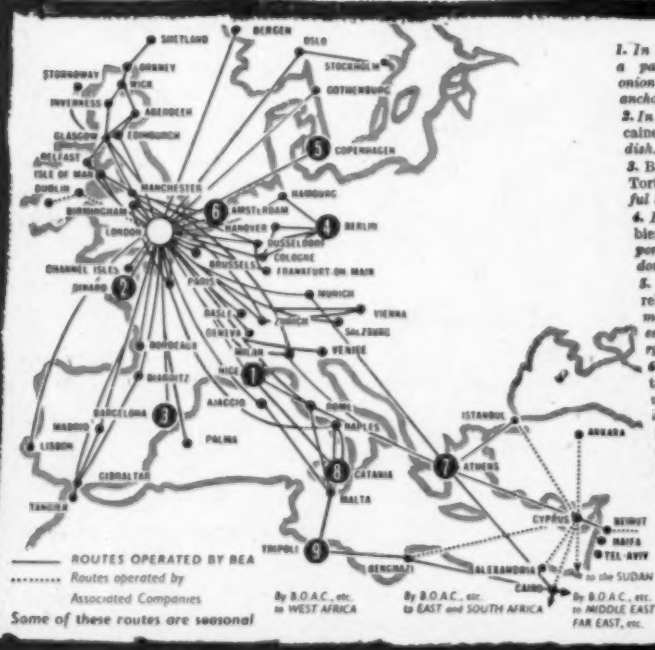

1. *In* Nice *try* Ancholade: *a pastry with tomatoes, onion and fresh salty anchovies.*
2. *In* Dinard *go for* Armoricaine — *a lovely hot lobster dish.*
3. Barcelona's *the place for* Tortilla Española, *a colourful Spanish-style omelette.*
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5. *In* Copenhagen, Smørrebrød *is a "must" — marvellous filleted smoked eel and scrambled egg on rye bread.*
6. *In* Amsterdam, Kalfoesters met Andijvie *(fried veal steaks with endive) are delicious.*
7. *In* Athens *try* Kebab — *mutton with chopped onions, bay leaves and tomatoes grilled on a skewer.*
8. *A great favourite in* Sicily *is* Coniglio in Agrodolce: *rabbit in sweet and sour sauce.*
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We thus have a proportional basis for estimating the international passenger's average trip length. Before we calculate it we must consider whether the average distance flown by all domestic passengers throughout the world is the same as for the United States. The U.S.A. is a special case—it is a large country with large and widely dispersed centres of population, and for the purpose of this analysis we shall hazard that the average trip length flown by the world's other domestic passengers is less, say 400 miles. (This is a fairly safe estimate to make since, as we have shown, domestic traffic outside the U.S.A. is only a small proportion of total world domestic traffic. A 400-mile trip length also is the figure for Europe, which accounts for about half the world's domestic traffic outside the U.S.A.)

We thus arrive at an average passenger journey length for all world domestic services of 520 miles.

To recapitulate on this ponderous reasoning, we know that the average trip length on all world routes, international and domestic, is 560 miles. We have estimated that the figure for domestic routes is 520 miles. What is the average for passengers on international routes? We know that one-third of world traffic is international and two-thirds is domestic. Thus we arrive at a figure of 640 miles for the average distance flown by international passengers.

We are now able to assess the percentage of domestic traffic on medium-haul stages. We have previously shown that the international percentage is 32, and on a proportional basis of passenger trip lengths, the corresponding figure for domestic medium-haul flights works out at about 26 per cent.

If we are willing to say that this domestic percentage will be about the same in 1962, we at once have the total (international plus domestic) world medium-haul traffic in that year. In Part I we showed that, assuming traffic continues to increase *at the same average annual rate* as has been observed since 1948—i.e., 17 per cent—by 1962 it will be 22,000 million tonne-km. Assuming that the international share remains as one-third of the total, we at once have the *international* medium-haul traffic in that year —32 per cent of 7,330 million tonne-km, or about 2,340 million tonne-km. Similarly, *domestic* medium-haul traffic will be 26 per cent of 14,670 million tonne-km, or about 3,810 million tonne-km.

Thus, in 1962, the total world traffic requiring transportation over medium-haul sectors is calculated to be 6,150 million tonne-km.

This is a significant figure, because it gives us the amount of medium-haul transport capacity (including, of course, that already ordered) needed in 1962. Assuming a load factor of 60 per cent, it works out as 10,250 million tonne-km.

To find the proportion of this medium-haul capacity which is still to be bought from the manufacturers, we have to subtract from it (a) the capacity represented by orders already placed, and (b) the capacity represented by surviving existing piston transports. The former (a) is readily obtained from Part 1, Table 1: it amounts to 4,436 million tonne-km.

The latter (b) requires careful estimation. We believe that of all the DC-6A/Bs and Constellation 649/749/1049 in service or being delivered today, the great majority of their survivors in 1962 will be at work on medium sectors. The present trend for bigger aircraft to be used on shorter routes (an example is the use of 049 Constellations and DC-6s on Viscount and Convair 340 sectors) will be accelerated when the big jets come into service, and we shall see most of the aircraft which we at present regard as long-haulers (i.e., 1,500 miles and above) at work as medium-haulers—except perhaps the majority of the DC-7 series and later Super Connies. This will undoubtedly influence strongly the size of the market for the new, costly and untried turbine medium-haulers, especially if, as seems possible, big turboprop re-engining business is in the offing. We shall therefore assume that, of all the Lockheed and Douglas four-engined piston transports now in service or on order (excluding 049 Constellations and DC-6s, and DC-7-series and the latest Super Constellations, which may well be mostly on short-haul and long-haul work respectively) the whole of the capacity surviving in 1962 will be offered on medium-haul sectors. This capacity is estimated to be 3,370 tonne-km (see Part 1, Table 2).

Thus the proportion of the medium market still to be filled by 1962 is 10,250−(4,436+3,370), **or 2,450 million tonne-km.** This is 22½ per cent of the total 1962 market calculated in Part 1—a reasonable proportion in the light of the results of our medium-haul traffic-researches previously given.

In terms of actual aeroplanes, this 2,450 million tonne-km represents something like 150 medium-haul transports still to be ordered by the airlines and constructed and delivered by six manufacturers (eight if we include Douglas and Boeing) between now and 1962.

de Havilland Comet, ordered by B.O.A.C. and Capital. Of all the new medium transports offered, the Comet is the only one with operating experience behind it. Engines are Rolls-Royce Avons.

It becomes apparent that there is not enough business to go round, to an extent which can be very broadly measured in the following way.

Let us assume that this 2,450 million tonne-km of medium-haul capacity shown to be required in 1962 is shared equally among the eight firms—i.e., 306 million tonne-km capacity apiece. This works out, very roughly, as 19 Comet 4 and 4As, 18 Britannias, 22 Caravelles, 21 Vanguards, 22 Electras, 14 DC-9s, 14 Boeing 727s, and 14 Convair 880s. With adjustments for the different delivery-dates, and for the orders already placed (see Part 1), this means that the theoretical total output of each manufacturer up to the end of 1962 will be: de Havilland, 52 (over five years); Bristol, 60 (six years); Sud-Est, 34 (five years); Vickers, 41 (three years); Lockheed, 151 (five years); Douglas, 14 (two years); Boeing, 14 (two years); and Convair 54 (three years).

Although this "fair shares for all" distribution is purely hypothetical, it does serve to show that the market between now and 1962 appears to be incapable of providing really good business

Impression of the Vickers Vanguard (Rolls-Royce Tynes), the only British transport designed from the outset for the medium market.

Left, the Douglas DC-6B, the most economic transport on the air routes. It is typical of the Douglas and Lockheed piston transports which, by going on, will limit the orders for the new medium transports. Right, Sud-Est Caravelle, Avon-powered French jet challenger—first to adopt the "tail cluster" engine installation, a logical arrangement which may be more widely applied in future years.

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for each manufacturer—especially for the American firms, who would not be content with the smaller relative outputs of their European rivals. It may be said that, with the possible exception of Lockheed, these production figures represent at most only the minimum with which each manufacturer would be satisfied.

It needs only slight redistribution of these "equal shares" to put one or two firms right out of the picture. Exactly how the orders will be shared will of course depend upon factors outside the scope of this analysis—namely the relative merits of each aircraft, the division of opinion between the jet and turbojet creeds, and (above all) the reputations of each manufacturer and of the firm which makes its engines.

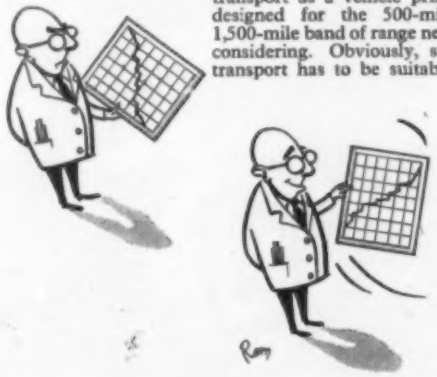
But—and this is our point—any significant redistribution of our "equal shares," which is obviously most likely, seems bound to result in severe disappointment for three or even four firms. And it is a sobering thought that, although only eight firms have been considered in our appraisal of the medium market, both Russia and East Germany also are producing medium-haulers for export.

If it could have been shown that the 1962 market would be large enough to justify each firm building an average of 30 or 40 aircraft per year, we might have concluded that there would theoretically have been plenty of profitable business to go round. But it appears otherwise. The *theoretical* conclusion must be that the medium-haul market will not be big enough for the profitable gain of all the eight firms competing for a share of it. The *realistic* conclusion must be that the market will only really be profitable for three or possibly four firms.

* * *

How do we reconcile these findings with those of Part 1, which were that there is a still unfilled market for all forms of transport of 11,000 million tonne-km?

Having shown that the heaviest share of traffic is not carried over medium sectors, and that it is carried over the short-haul and the long-haul stages, we can only conclude that present conceptions of the medium-haul transport as a vehicle primarily designed for the 500-mile to 1,500-mile band of range need reconsidering. Obviously, such a transport has to be suitable for operation over all sectors falling within that band; but it seems that if it is to be the airliner for which the airlines are most hungry, it has to be the *optimum* vehicle for the sectors where the most tonne-km of capacity are going to be required. In other words, it has to be the optimum vehicle for sectors around and below 500 miles, and—to a lesser extent—around 1,500 miles and above.



Of the eight medium transports now being hatched, those which best fit the terms of that conclusion will, we venture, get the business.

Footnote: Recently Boeing forecast a market throughout the sixties for 1,500 medium jet transports (*Flight*, November 16). We do not know the basis of this estimate; but forward projection of the results of this analysis will be found to show that just about 1,500 medium transports, *turboprop as well as jet*, will be required between 1960 and 1970 in addition to those already ordered. This means "fair-shares-for-all" business of 20 to 25 aircraft per year throughout the sixties for each of the eight medium transport manufacturers. Assumptions are a continuing 17 per cent traffic rise (Boeing assumed 15 per cent) and, over-generously perhaps, the complete replacement of all four-engined piston equipment on scheduled medium-haul services by the end of 1969.

ASSUMPTIONS

(1) World traffic (excluding U.S.S.R. and China) will rise by 17 per cent each year to become 22,000 million tonne-km in 1962. (Part I.)

(2) Load factors of 60 per cent have been assumed.

(3) Medium-haul stages lie between 300 and 1,500 miles.

(4) Only services over these stages likely to be operated by medium-haul transports have been considered.

(5) All-cargo services, and the European medium-haul networks o American operators, and *vice versa*, have been ignored.

(6) Average trip length for all domestic passengers outside the U.S.A. is 400 miles.

(7) Total annual international traffic is twelve times that documented for one month examined.

(8) About 25 per cent of the capacity of all existing or ordered Douglas and Lockheed piston-engined transports will be exclusively medium-haul in 1962.

CONCLUSIONS

(1) Total world capacity still to be filled by all forms of airliner in 1962 will be 11,000 million tonne-km (Part I).

(2) Medium-haul share of international traffic is 32 per cent (and will remain at about this percentage).

(3) Total world medium-haul capacity required in 1962 will be 6,150 million tonne-km.

(4) Of this, about 2,450 million tonne-km capacity remains to be filled. This represents about 150 medium-haul transports still to be ordered and delivered by 1962.

(5) This total does not represent sufficient business for all eight of the present and intending manufacturers of medium-haul transports.

(6) The unfilled 1962 market is mainly for transports with optimum short-haul abilities and, to a lesser extent, for long-haul transports.

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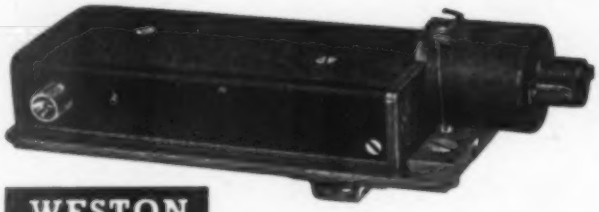

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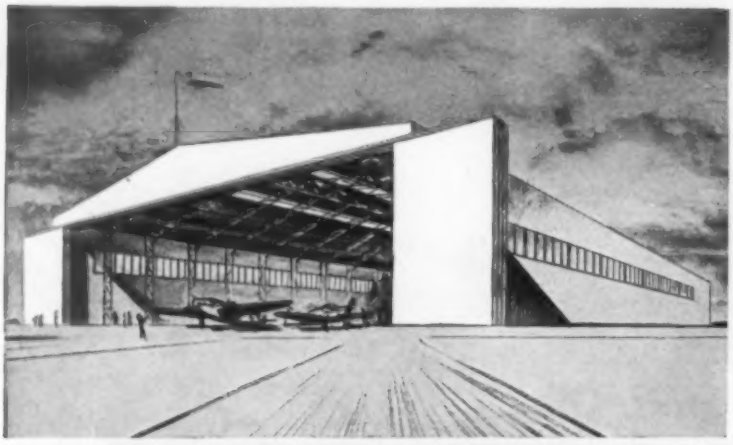

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The Future of the Helicopter

RECENT correspondence under the above heading persists in viewing the helicopter as a potential short-range public transport vehicle.

The operating cost of a flying machine depends upon its empty weight, its complexity, the payload it can carry, its fuel consumption, its mean speed and the number of hours in each day in which it can be used.

In every single one of these parameters, except the last, the helicopter is considerably worse off than the aeroplane, and most informed people have now given up pressing for "airbuses and heliports."

The helicopter is without doubt by far the most expensive way yet conceived by man to get from A to B. At the same time it is, by an equally large margin, one of the most valuable special tools devised by man. It would be a good thing if the country's limited effort in the helicopter field were directed towards reliable, cheap and simple machines to do the jobs demanded by the Services and to provide an efficient emergency rescue system.

For public transport over short distances, what the country needs most is some good, straight roads supplemented by tube and mono-rail systems. The suggestion that any helicopter, whether pure, compound or convertible, could achieve (I quote) "an efficiency and economy far superior to those of anything else in the air over ranges up to 400 miles" does not bear analysis. The best that a high-speed convertible helicopter could do would be very nearly to equal aeroplane costs. The pure or the compound helicopter cannot do better than between twice and three times aeroplane costs and will have to improve itself a lot to do even this.

Holywood, Co. Down. F. H. ROBERTSON.

Early U-2s

THE Lockheed U-2 has been around for longer than some of your readers suppose. One was spotted by a member of the Air League over Thetford, Norfolk, on May 14, and from that date to May 19 several more reports came in. Neither we nor our members could give it a name at that time, but a month or so later its identity was established. There was only one at that time and it was based at Lakenheath.

London, W.1. F. N. HILLIER,
Secretary-General, Air League of the British Empire.

[*Flight's* first reference to the U-2 was on May 18.—Ed.]

High-performance Instrumentation

I SHOULD like to make a few minor personal comments on the article of Mr. Morss in your issue of November 23. Firstly, may I say that I agree with all he has to say in criticism of our present instruments, and, knowing nothing of the "totally new instrument system," to which your editorial note refers, I feel that his suggestions have much to commend them. It is on the details of his new instruments that I would like to comment. Taking his new panel from left to right, top to bottom, I would criticize as follows:—

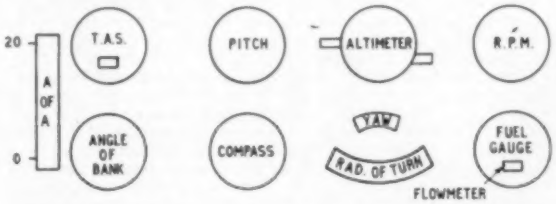
Angle of Attack Indicator. What a boon, both in the circuit and at high level! But I feel that in spite of Mr. Morss' argument of indication of reserve of lift, most squadron pilots would prefer to treat it simply as an angle of attack indicator, with the danger limit at the top, as in j.p.t. gauges or g meters.

T.A.S.I.—Machmeter. [Editor's note: Under this heading our correspondent criticizes Mr. Morss' true-airspeed indicator, but he has apparently read the n.m./min graduations on the dial as fractions of Mach numbers, and his remarks do not, therefore, apply. We accordingly omit this paragraph of his letter.]

Pitch Angle Meter and V.S.I. I think it would be better to stick out for a monitored instrument giving true flight-paths, and dispense with the V.S.I. If this cannot be done, then at least let us simplify the artificial horizon by throwing away the presentation of pitch angle completely. With present instruments, zero angle can be held far more simply by use of the V.S.I., and climb or dive angle by use of the A.S.I. or Machmeter, and either power settings for the climb or airbrakes, flaps, etc., for the descent.

Altimeter. No comment.

Combined Rolling and Yawing Meter. At one point in his article Mr. Morss deprecates the several needles of the present altimeter, and then he gives us this—five pointers in one presentation! I submit that the angle-of-bank indicator should be used below the T.A.S.I., and the angle of attack meter be "wrapped round" this and not the T.A.S.I.; that the compass remain central; that the radius-of-turn meter, very useful in high-level interceptions, be moved to the right; and that the yaw indicator, which is rarely used, put wherever is most convenient—probably on the right to give symmetry. Thus the panel would become:—



I have thrown in the two gauges on the right to show what I believe to be the other three really basic instruments which the pilot wishes to be able to see easily at all times. Lastly, I reiterate that this all applies to the very limited use of the high-altitude day intercepter.

R.A.F. Linton-on-Ouse. A. B. MUSGRAVE, F/O.

Proximity Indicator

IN the article "Airborne Proximity Indicator," in *Flight* of November 30, the following "detection" ranges are quoted for the Collins warning device:— 200-400ft, 400-800ft, 800ft-1 n.m. and 1 n.m.-2 n.m. If 2 n.m. is the maximum range, then surely with two aircraft flying at 300 kt at the same level and on collision courses the warning time will be 12 sec. If the aircraft involved are jets, then the warning time will be cut down to about 8 sec. In addition account has to be taken of the reaction time lag of the pilot(s), the manœuvring time-lag and the large radius of turn required by a jet aircraft. Therefore, are the ranges quoted realistic?

The near-miss problem is a serious one and, therefore, the principle of "all, or nothing at all" might be better in this case than "something is better than nothing."

London, N.W.2. L. F. E. COOMBS.

[The Collins Radio Company issued this information as a preliminary specification for the PI-101. They are no doubt aware of the potential limitations of the equipment, and will have to study these before finally offering it to operators.—Ed.]

FORTHCOMING EVENTS

Dec. 15. British Women Pilots Association: Christmas Party.
Dec. 15. Lasham Gliding Centre: Christmas Party.
Dec. 15. Surrey Flying Club: Christmas Party.
Dec. 19. Kronfeld Club: Christmas Party.
Dec. 20. R.Ae.S.: All Day Section Lecture on Transonic Wind Tunnel Testing Techniques: Papers by H. F. Vessey, F.R.Ae.S., R. Hills, A.F.R.Ae.S., J. A. Kirk, A.F.R.Ae.S., F. O'Hara, and F. E. Roe, Grad. R.Ae.S.
Jan. 3. R.Ae.S.: Young People's Lecture: "Experiences of an Airline Pilot," by Capt. O. P. Jones, C.V.O., O.B.E., A.F.R.Ae.S.
Jan. 5. British Interplanetary Society: "Astronomy and Earth Satellites," by M. W. Ovenden, M.A., B.Sc., Ph.D., F.R.A.S.
Jan. 8. R.Ae.S.: Section Lecture: "Significance of Flow Separation in Three Dimensions," by E. C. Maskell, A.F.R.Ae.S.
Jan. 10. R.Ae.S.: Presidential Address by E. T. Jones, C.B., O.B.E., F.R.Ae.S.
Jan. 11. Helicopter Association: "Analogue Computer Development with Reference to Helicopter Applications," by B. H. Venning, B.Sc. (Eng.), A.C.G.I., A.M.I.E.E.
Jan. 17. R.Ae.S.: Section Lecture: "Electronic Control Techniques in Aircraft Manufacture," by G. S. Kermack, A.F.R.Ae.S., and H. Ogden, A.F.R.Ae.S.
Jan. 18. Institute of Navigation: "All-weather Operation of Transport Helicopters," by P. A. Hearne.
Jan. 24. R.Ae.S.: Main Lecture: "Aeronautical Research in Holland," by Prof. Dr. Ir. H. J. van der Maas, F.R.Ae.S.

R.Ae.S. Branch Fixtures (to Jan. 18):—
Dec. 14, *Weybridge*, Annual Dance. Dec. 20, *Belfast*, Debate. Jan. 8, *Boscombe Down*, "Defence Policy," by Marshal of the Royal Air Force Sir John C. Slessor. Jan. 9, *Luton*, Debate; *Weybridge*, Brains Trust. Jan. 10, *Bristol*, "Design Problems of Modern Wind Tunnels," by R. Hills. Jan. 17, *Bristol*, "Wind Tunnel Instrumentation," by J. R. Anderson.

CIVIL AVIATION

Mr. George Gardner (centre), president of Northeast Airlines, seen with (left) Mr. R. E. Harvey of Short Bros. and Mr. R. S. Brown of Bristol. The picture was taken at Belfast, where Northeast's Britannias (see below) are being built.

THREE BRITANNIA ORDERS IN A WEEK

BRISTOL made three more entries in their Britannia order-book last week. In addition to the Royal Air Force Transport Command's order (recorded on page 931) for three more 253s, contracts were signed by Northeast Airlines of Boston, and by Hunting-Clan Air Transport of London.

The triumphant Northeast order, announced in our last issue, was the climax to an unusually long and suspenseful period of negotiations. Northeast's technical decision on the Britannia was, it now appears, made soon after the aeroplane's tour of America last August: the signing of the contract hung (by a thread) upon the U.S. Civil Aeronautics Board's final confirmation of its decision to award the New York-Miami route to Northeast. This decision meant that the airline, with its hitherto impossible route-network, would have a chance to free itself of government subsidy.

The weeks of uncertainty are now past, and Mr. George Gardner, the airline's president, enjoys the prospect of operating America's richest route with the most competitive airliner he could have bought for such quick delivery (October 1957).

The news of Hunting-Clan's repeat-order for Britannias (a second was added to the one ordered in September) again raises the question of what the British independent intends to do with them. Only the week before, at the B.I.A.T.A. dinner, the voice of the independents was raised in protest at the lack of prospects for private-enterprise air transport in this country, and the consequent discouragement to their hopes of re-equipping with modern aircraft. Now we have one of the leading and most influential independents (which, incidentally, has just taken delivery of two more Viscounts), placing a £2½-million order for more first-line turbine equipment. It is difficult to imagine that the Britannias have been bought on the expansion-prospects of the company's present operations, which comprise trooping, freighting, and scheduled colonial-coach services. Do we detect here a change in independent policy? Could it be that from now on they intend to negotiate from the strength of their equipment?

* * *

The Britannia civil order-book is now as follows: **B.O.A.C.** 15 102s (eight delivered), two 302s, 16 312s (for delivery starting in spring 1957); **El Al,** three 313s (starting in the summer of 1957); **C.P.A.L.,** five 314s (from September 1957); **Northeast,** five 305s (from October 1957); **Hunting-Clan,** two 317s (from May 1958). This accounts for 48 civil Britannias sold to date. The grand Britannia order-book total is now 65, including orders from the **M.o.S.** (one 301 prototype and three 250s for use by independents), and **R.A.F. Transport Command** (13 253s).

Skyways have just presented to the Beauvais authorities this painting of a Jodel at their airport, which is the terminal of Skyways Coach-Air service, and is soon to be given a new terminal building. Looking at the picture in this photograph are Skyways' managing director, Mr. Eric Rylands (centre), and M. Guy Herpin and M. Marcel Communeau.

FIRST U.S. ORDER FOR A HERON

FOR a long time it has seemed probable that the de Havilland Heron would, like the Dove, appeal to the world's largest buyer of civil aeroplanes—the American businessman. A Heron was first demonstrated in the U.S.A. in 1954, and again (newly fitted with D.H. feathering propellers) in the following year.

The Heron has now been ordered by an American operator—not, surprisingly, for executive use, but for local-service operations. Illini Airlines of Rockford, Illinois, a small company of 50 employees, last year bought two ex-excutive Doves, fitted them with eleven seats, and has since been using them with great success on a scheduled shuttle service between Madison, Rockford, Illinois, and Chicago. With such success, in fact, that Mr. Douglas C. Harvey, Illini's president, decided to increase his capacity by buying a Heron. "Our big hope," Mr. Harvey says, "is a four-engine Heron we have ordered from de Havilland, with delivery expected in January. This plane will be put into non-stop commuter service between Rockford and downtown Detroit City Airport next spring."

THE CORPORATIONS AND FUEL TAX

THE effect upon the Corporations of the heavy new petrol tax is likely to be severe. Only recently (*Flight*, November 23) B.E.A's chairman hinted that, unless costs could be kept down, the Corporation might end the year with a loss—a disappointing indication that B.E.A's strengthening financial position is still not resilient enough to withstand a poor summer season. Fortunately for B.E.A., the kerosine-consuming Viscount—their best money-earner—is not likely to be affected by the petrol tax. Even if it were, the aircraft is used largely on services to Europe, where its fuel would in any case be exempt from British duty. Nevertheless, it is estimated that domestic fuel costs of B.E.A.'s piston fleets may amount to an extra £1,000 per day, a cost which has been partially passed on to the users of B.E.A.'s domestic services in the form of a temporary five per cent increase in fares.

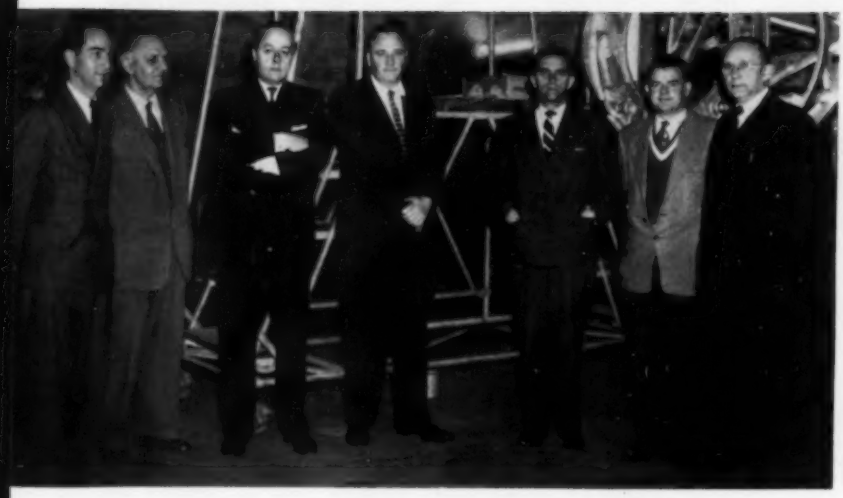
B.O.A.C.'s costs may go up by about £250 a day—less than in the case of B.E.A., because of the large proportion of petrol taken aboard overseas. B.O.A.C., of course, already face a deficit at the end of the current financial year. Their fares (as on B.E.A.'s international services) are fixed by I.A.T.A. and will remain unchanged.

HOP ABOARD A HELICOPTER

AFTER a little more than two months' operation of mail and cargo services, New York Airways were scheduled to begin passenger helicopter flights into the Manhattan heliport on the Hudson river on December 5. There will be 23 flights a day into the West 30th Street terminal, of which 13 will be passenger services operated by four-seat float-equipped S-55 helicopters: this represents 104 passenger movements a day.

Up to the beginning of November, New York Airways had carried over 68,200 scheduled passengers—a measure of the popularity of their expanding network of helicopter routes. They are confident that the growth of the new passenger service between Manhattan, Idlewild, Newark and La Guardia will prove sufficiently substantial by May next year (they estimate triple the present traffic) to support the introduction of 12-seat S-58 helicopters.

The flying time between La Guardia and Manhattan is 11



K.L.M. officials and their Weybridge host in front of the airline's first Viscount 803. (Left to right) Messrs. J. Bok and G. Elleman (K.L.M. personnel at V-A.), J. A. Henderson (V-A. customer liaison), F. Besancon (K.L.M. executive vice-president), J. Luyhres (engineering and maintenance vice-president), and J. van T. Riet and C. van Den Berk (K.L.M.).

minutes and between Manhattan and Newark 12 minutes, and although the journey from the centre of New York to the international airport at Idlewild must at present be broken at La Guardia, direct flights will begin in May—when it is intended to start night operations as well.

CIVIL OWNERS' SAFETY CERTIFICATES

THE Air Registration Board's *Notice to Licensed Aircraft Engineers and Owners of Civil Aircraft No. 45* "Privately Owned Aircraft and Three-Year Periods Certificates of Airworthiness" has been reissued and notice No. 17, Issue 8 has been cancelled. The new Notice reminds owners that their C. of A. only remains valid if their aircraft are maintained in accordance with the Royal Aero Club Schedule by a club or firm approved by A.R.B. (and not, as required by the last issue of the Notice two years ago, by the Aero Club). A list of approved organizations can be obtained by application to A.R.B., but "reasonable grounds" for this request must be shown.

The new Notice also reminds licensed aircraft engineers that they must not certify that an aircraft or engine has been maintained according to the schedule unless the firm or club by whom they are employed has been A.R.B.-approved.

IMPACT OF THE HEAVY JETS

IN *Flight* of November 23, page 835, we recorded news of improvements being made to three more international airports —London, Kloten (Switzerland) and East London (South Africa). Almost every week airport improvement programmes are announced: here are two more of which we have news this week. The Leonardo da Vinci Field near Rome (a replacement for Ciampino) is now due to be completed in 1960. At Delhi, India's Communications Minister, Mr. Raj Bahadour, said last week that no decision has yet been taken on the site of Delhi's new international airport, which is to be constructed to relieve the growing burden on Palam.

NEW FINANCE COMPANY

A LONDON finance group, together with foreign business houses, has revived the Aircraft and General Finance Corporation, Ltd. The corporation was originally founded in 1932 under the chairmanship of Mr. J. D. Akers (who is on the board of the new company), but operations were suspended at the outbreak of war. The new chairman is the Rt. Hon. Lord Sempill, A.F.C., F.R.Ae.S., and the managing director G/C. Edward Mole, B.Sc., A.F.R.Ae.S. Their photographs appear below.

Lord Sempill has been connected with aviation—as a pilot and business executive and as a member of aeronautical advisory committees—for nearly all his life; G/C. Mole is well known as an aviation consultant. He was chief engineer of R.A.F. Transport Command and representative at the National Gas Turbine Establishment during his R.A.F. service; later he became manager of B.O.A.C.'s development flight and Director of Civil Aviation in the Bahamas.

The Corporation are to start business as aircraft brokers and consultants with a special interest in arranging credit facilities to assist buyers of aircraft and aviation equipment. Their offices are at 26/27 Poultry Chambers, 11 Poultry, London, W.C.2.

BREVITIES

DE HAVILLAND'S Far East manager, Mr. Hugh Rice, said in Tokyo on December 2 that the Comet will be landing regularly at Tokyo's international airport early in 1958.

* * *

Closed-circuit television will be used by B.O.A.C. announcers at the Victoria, London, Airways Terminal.

* * *

Lufthansa's purchase of four Boeing 707s will be assisted by a £3.7m credit from the Chase Manhattan Bank.

* * *

Avianca of Colombia celebrated its thirty-seventh birthday on December 5. In 1955 the airline carried 922,804 passengers.

* * *

B.O.A.C.'s third Douglas DC-7C to be delivered made a very fast non-stop flight from New York last week. Its average ground speed (aided by a following wind of 107 m.p.h.) was 427 m.p.h.

* * *

T.W.A. resumed services between the United States and Cairo on December 9. The service to Tel Aviv was resumed on December 7.

* * *

Pakistan Intenational Airlines announced that their domestic fares ("which are some of the lowest in the world") were increased "slightly" on December 1.

* * *

As a result of an agreement between the Lebanese and Syrian authorities, aircraft flying over Syria are no longer compelled to land at Damascus. Normal international air traffic between Beirut to the Far East is expected to be resumed shortly.

Mr. Arthur E. Jenks, chief of C.A.A.'s flight inspection division, has received the Flight Safety Foundation award for his method of using high altitude patrol aircraft equipped with "electronic brains" to check every air route navigation facility in the United States every thirty days.

* * *

The Air League of the British Empire has submitted a proposal to the Minister of Transport and Civil Aviation that 100 young men should be offered scholarships for a two- or three-year course of training up to commercial licence standard. The cost (£1,500 to £2,000) would be borne jointly by the Exchequer, the candidate and the operator by whom he would subsequently be employed.

Lord Sempill (left) and G/C. E. L. Mole, of the Aircraft and General Finance Corporation. (See above.)

A part-time instructor at Elstree Flying Club, Miss Audrey Windle is here seen at a pre-flight briefing with club-member Robert Jowers. Miss Windle obtained her Assistant Instructor's Rating last April.

Peter Scott, the ornithologist and artist, is a member of the Bristol Gliding Club. With him in this photograph are his daughter Nicola and (left) P. E. Collier, the club's chief flying instructor.

CLUB AND GLIDING NEWS

AVIATION fuel for private-owner and club use is to be restricted to 75 per cent of the normal rate of supply, in order to effect the same order of economy as the rationing of motor-vehicle fuel. The increase in fuel tax announced last week is almost certain to be reflected in higher flying rates at the majority of clubs.

Since the announcement of petrol rationing, an application for supplementary allowances for the cars of members of flying clubs, made by the Association of British Aero Clubs, has been refused. Following the news of the price-increase of fuel, applications for an extension of petrol-tax relief granted to the clubs were made by the Royal Aero Club, the Popular Flying Association and the British Gliding Association (see also page 916).

FILM nights at the Scottish Aero Club, Perth, continue to attract fairly good audiences. Club Flying hours are beginning to fall to winter levels, but November's hours were 70 above the November 1955 figure. Three P.P.L.s were obtained during the month. The club's annual dinner is to be held on Hogmanay.

RECENT first soloists at the Southern Aero Club, Shoreham, include Miss Sylvia Adams, an amateur archaeologist and photographic enthusiast; David Hatchwell, who hopes to combine flying and photography as a career; and E. A. Young. Chief flying instructor at Shoreham is veteran pilot C. L. Pashley.

PLYMOUTH Aero Club's Barber Cup was presented to R. Holmes (for his landing-contest performance) at the Hallowe'en party at Roborough clubhouse recently. The Butland Navigation Trophy is to be retained by M. Armstrong. Over 30 pupils have made first solos with the club since the beginning of the year; the more recent include A. W. Major, J. T. Rambaud, A. Guilbert, L. R. Harries, W. Kilner, F. J. Woodford and A. E. Braidwood. New P.P.L.s have been obtained by A. E. Thuenissen and R. J. Best, and the club's chief engineer, Dick Gliddon, has obtained an Assistant Instructor's Rating. This year's flying training programme for the Dartmouth midshipmen at Roborough ended on November 30; next year's is to begin on March 1.

LANCASHIRE Aero Club's new clubhouse extension at Barton Airport is to be officially opened tomorrow, December 15. Rebuilding, which has been carried out entirely by the efforts of members, was found necessary because of increased activity. The extension was designed by Martin Barnes, a Manchester box-maker; the new bar was constructed by Frank Emery, a Stockport builder; and a large dance floor has also been incorporated. The opening is to be celebrated with a cocktail party, dinner and dance.

November's flying by club members amounted to 72 hours. Recent first solos have been logged by cadet Morris, Mr. Hayes and Mr. Hodge; and P.P.L.s have been obtained by cadets Rothwell, Simmonds and Wetton and Messrs. E. Lacey, A. Lacey and McHardy. A children's party, followed by an informal dance, is to be held on December 22.

THE training fleet operated by Elstree Flying Club now consists of ten aircraft—four Magisters, four Autocrats, Gemini and Chipmunk. If the demand warrants it, a second Chipmunk may be introduced in a few months' time (the first, G-AOSY, has already been sampled by members of most other clubs in the London area as well as being kept busy by Elstree members). This year's flying total to the end of November was 3,643 hours, compared with 2,979 for the same period in 1955.

In an effort to concentrate on advanced training, Elstree at present has five people undergoing courses for the Commercial Pilot's Licence. Two of these, Keith Campbell and Barry Mason, are on full-time instruction. In addition, five pilots, four of whom are Handley Page employees, have begun a course for the Assistant Instructor's Rating. Full-time courses for the Instructor's Rating, at which pilots from the Services and from other clubs will be welcome, are being planned.

A NEW British women's height record for single-seat gliders was set up (subject to confirmation) by Mrs. Anne Burns, flying a Skylark 3 at the Midland Gliding Club's Long Mynd site on December 2. Mrs. Burns reached a height of 12,000ft above sea level, thus becoming the only woman to obtain "Gold C" height in this country. The previous height record was that of 6,233ft obtained by Mrs. Barbara Alexander in 1952.

FORTHCOMING social events organized by the Kent Gliding Club, who operate from Detling, include a Christmas party at the clubhouse on December 22 and a dance at the Tudor House, Bearsted, on January 12.

THE British Gliding Association reminds members that claims for the 1956 awards of the de Havilland Cup, Manio Cup, Wakefield Trophy, Volk Cup, Seager Cup and Douglas Trophy should be made by the end of the year. These are respectively for greatest gain of height, best goal flight, longest distance, best out-and-return, best two-seater performance and best club cross-country performance.

THE newly formed Air Service Training Gliding Club, based at Hamble Aerodrome, Hants, hopes to begin dual training early next year. The club has some 40 flying members at present; membership is confined to A.S.T. employees.

The second Piper Comanche, at present being flight-tested at Lock Haven, Pennsylvania. The machine is powered by a 180 h.p. Lycoming engine (a 250 h.p. version is planned) and incorporates an "all-flying" tail.

Personally speaking

—a series of contributions on questions of the hour by leading international aviation personalities.

A. VERNIEUWE

—Senior Vice-President Sabena, and one of the greatest authorities on the operation of Civil Helicopter Services.

Civil Helicopter Operation

The choice of Brussels, in 1953, as the centre of the first helicopter service was no accident. If one looks at a map of Western Europe, Brussels is seen to lie at the centre of a very industrialised and densely populated area (about 200 inhabitants per sq. km.). In addition, by drawing a circle round the Belgian capital, representing the average range of modern helicopters (about 350 km.), one includes the important cities of London, Paris, Amsterdam and all the large towns of the Ruhr. In this way the most favourable conditions for the sensible development of the helicopter are achieved; density of population, large numbers of industrial and urban centres with comparatively short distances between them, a favourable geographical relief.

In the development of commercial aviation, where the urgent need is to reduce travel time between cities and airports, the helicopter has an important part to play. Owing to the increased volume of traffic on roads, and the fact that modern airfields are being built farther away from towns, the air traveller is losing an appreciable amount of those precious minutes which flying has so largely saved. To this problem, the helicopter provides an obvious and practical solution.

Finally, towns with a helicopter service attract new traffic. For, not only does the helicopter enlarge the hinterland of the town it serves; it also considerably increases the accessibility of the airport from which it operates.

Whatever future solution commercial aviation adopts for transport over short distances, the helicopter will have fulfilled present needs and rendered service to the community by enabling large towns without aerodromes to have access to air transport.

AVIATION BP SERVICE

serves aviation well

The international aircraft fuelling organisation of
The British Petroleum Company Limited

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November's flying by club members amounted to 72 hours. Recent first solos have been logged by cadet Morris, Mr. Hayes and Mr. Hodge; and P.P.L.s have been obtained by cadets Rothwell, Simmonds and Wetton and Messrs. E. Lacey, A. Lacey and McHardy. A children's party, followed by an informal dance, is to be held on December 22.

THE training fleet operated by Elstree Flying Club now consists of ten aircraft—four Magisters, four Autocrats, Gemini and Chipmunk. If the demand warrants it, a second Chipmunk may be introduced in a few months' time (the first, G-AOSY, has already been sampled by members of most other clubs in the London area as well as being kept busy by Elstree members). This year's flying total to the end of November was 3,643 hours, compared with 2,979 for the same period in 1955.

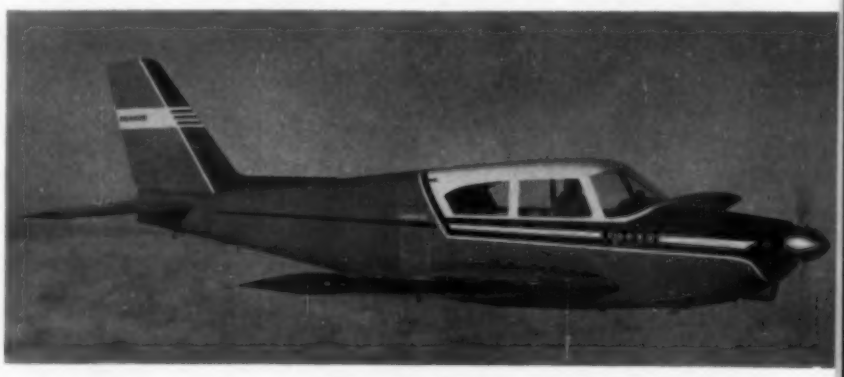
In an effort to concentrate on advanced training, Elstree at present has five people undergoing courses for the Commercial Pilot's Licence. Two of these, Keith Campbell and Barry Mason, are on full-time instruction. In addition, five pilots, four of whom are Handley Page employees, have begun a course for the Assistant Instructor's Rating. Full-time courses for the Instructor's Rating, at which pilots from the Services and from other clubs will be welcome, are being planned.

A NEW British women's height record for single-seat gliders was set up (subject to confirmation) by Mrs. Anne Burns, flying a Skylark 3 at the Midland Gliding Club's Long Mynd site on December 2. Mrs. Burns reached a height of 12,000ft above sea level, thus becoming the only woman to obtain "Gold C" height in this country. The previous height record was that of 6,233ft obtained by Mrs. Barbara Alexander in 1952.

FORTHCOMING social events organized by the Kent Gliding Club, who operate from Detling, include a Christmas party at the clubhouse on December 22 and a dance at the Tudor House, Bearsted, on January 12.

THE British Gliding Association reminds members that claims for the 1956 awards of the de Havilland Cup, Manio Cup, Wakefield Trophy, Volk Cup, Seager Cup and Douglas Trophy should be made by the end of the year. These are respectively for greatest gain of height, best goal flight, longest distance, best out-and-return, best two-seater performance and best club cross-country performance.

THE newly formed Air Service Training Gliding Club, based at Hamble Aerodrome, Hants, hopes to begin dual training early next year. The club has some 40 flying members at present; membership is confined to A.S.T. employees.



The second Piper Comanche, at present being flight-tested at Lock Haven, Pennsylvania. The machine is powered by a 180 h.p. Lycoming engine (a 250 h.p. version is planned) and incorporates an "all-flying" tail.

Personally speaking

—a series of contributions on questions of the hour by leading international aviation personalities.

A. VERNIEUWE

—Senior Vice-President Sabena, and one of the greatest authorities on the operation of Civil Helicopter Services.

Civil Helicopter Operation

The choice of Brussels, in 1953, as the centre of the first helicopter service was no accident. If one looks at a map of Western Europe, Brussels is seen to lie at the centre of a very industrialised and densely populated area (about 200 inhabitants per sq. km.). In addition, by drawing a circle round the Belgian capital, representing the average range of modern helicopters (about 350 km.), one includes the important cities of London, Paris, Amsterdam and all the large towns of the Ruhr. In this way the most favourable conditions for the sensible development of the helicopter are achieved; density of population, large numbers of industrial and urban centres with comparatively short distances between them, a favourable geographical relief.

In the development of commercial aviation, where the urgent need is to reduce travel time between cities and airports, the helicopter has an important part to play. Owing to the increased volume of traffic on roads, and the fact that modern airfields are being built farther away from towns, the air traveller is losing an appreciable amount of those precious minutes which flying has so largely saved. To this problem, the helicopter provides an obvious and practical solution.

Finally, towns with a helicopter service attract new traffic. For, not only does the helicopter enlarge the hinterland of the town it serves; it also considerably increases the accessibility of the airport from which it operates.

Whatever future solution commercial aviation adopts for transport over short distances, the helicopter will have fulfilled present needs and rendered service to the community by enabling large towns without aerodromes to have access to air transport.

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SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Nottingham U.A.S. Dines

IT is fitting that Nottingham University Air Squadron should have a quiver of arrows as its crest, for squadron members, drawn from the University and Loughborough College, are as zealous (in a different cause) as Robin Hood and his outlaws over whose terrain they operate; and their resultant success was revealed during the annual dinner held at R.A.F. Newton on December 5. For the commanding officer, S/L. N. Fletcher, reported that for the second year running N.U.A.S. had been second in the Hack Trophy competition, more hours had been flown, and more members recruited. The first achievement, especially, brought congratulations from A. Cdre. E. L. S. Ward, C.B., D.F.C., A.O.C. 64 Group, when he spoke as principal guest—deputizing for Air Marshal Sir Douglas Macfayden, K.C.B., C.B.E., A.O.C. Home Command.

S/L. Fletcher said N.U.A.S. now had 29 flying and 13 technical members, but this year those numbers would increase to 52 and 17. The squadron had already flown 2,175 hours, as against 1,855 for 1955; and they "didn't intend to be content with second best" in the Hack Trophy competition. Not surprisingly, the Vice-Chancellor, Mr. B. L. Hallward, described this as a "splendid report."

After A. Cdre. Ward, proposing "The Squadron," had mentioned that University Air Squadrons were not to be moved out of Home Command, which he hoped had many "satisfied customers," Cdt. Plt. I. R. Falconer in his reply pertinently asked when N.U.A.S. might have another advanced trainer to replace their Harvard, which, he said, was "usually unserviceable"—adding that they would accept a Jet Provost "in part exchange."

Other guests included G/C. R. V. McIntyre, D.F.C., S.A.S.O. at No. 64 Group headquarters (deputizing for G/C. "Johnny" Johnson, D.S.O., D.F.C.), the Lord Mayor of Nottingham (Cllr. W. J. Cox), and Cllr. R. Green, the Sheriff—who, unlike his Norman predecessor who disliked Robin Hood, could surely not but admire these N.U.A.S. "merry men" who exercise their Chipmunks to good purpose in the Sherwood Forest area.

Auxiliary Standards

THE Queen has approved the award of standards to three fighter squadrons of the Royal Auxiliary Air Force. They are No. 501 (County of Gloucester), No. 607 (County of Durham) and No. 608 (North Riding of Yorkshire) Sqns., based respectively at Filton, Ouston and Thornaby. All are at present equipped with Vampires.

No. 501 Sqn. went to France at the beginning of World War 2 and then served in the Battle of Britain, covered the Normandy landings and shot down over 100 flying bombs with its Tempests in 1944. No. 607 Sqn. destroyed 73 enemy aircraft in France before Dunkirk and moved to India after the Battle of Britain. It was at Imphal with Spitfires and supported the advance of the 14th Army. No. 608 Sqn. used Bothas, Blenheims and Hudsons on maritime operations, following the various landings and campaigns through Africa and Italy. It finished the war as a pathfinder unit flying Mosquitoes over Germany.

Back aboard "Eagle" but still wet after ejecting from a Wyvern during a strike near Port Said is Lt. D. F. McCarthy of No. 830 Sqn. (second from left). On his right is his C.O., Lt-Cdr. C. V. Howard, and on his left the Whirlwind crew which picked him up—Naval Airman Webster, Leading Airman Gammar and Lt-Cdr. P. E. Bailey. Looking on are Capt. H. C. D. Maclean, commanding "Eagle," and Cdr. B. C. H. Nation, Commander Air—and the Whirlwind.

R.A.F. Anniversary Concert

COMMEMORATING the foundation of the Royal Air Force, the second R.A.F. Anniversary Concert will be held next year on Saturday, April 13, at the Royal Albert Hall.

The first concert was organized in April this year by the Hallé Concert Society who wished thus to pay a tribute to the R.A.F. Sir John Barbirolli conducted. The orchestra now suggests making the concert an annual event, the proceeds being given to the R.A.F. Benevolent Fund.

Far East Assistance

THROUGH monsoon rain an R.A.F. doctor parachuted from a Singapore-based Valetta to help a sick woman on Christmas Island, 200 miles south of Java. He was F/O. J. Wilkinson, M.O. at Changi, who, at ten minutes' notice boarded the aircraft for the 850-mile flight. The aircraft, piloted by F/O. K. Speer, made two dummy runs over the flares marking the dropping zone in poor visibility. F/O. Wilkinson parachuted safely and was followed by a pack of medical supplies and blood plasma.

Although the Valetta had been given special clearance to refuel at Djakarta on the way out, refuelling facilities were withheld on the way back and the crew was delayed for a time.

Further mercy flights were made from Singapore when a Valetta dropped food and blankets to people marooned by floods in north-east Johore. Helicopters also played an active part in relief operations.

UNO Transporters

BASED at Capodichino airfield, near Naples, No. 435 Transport Squadron of the R.C.A.F. will provide air transport support for the United Nations Emergency Force operating in the Canal Zone. The squadron's C-119s are flying the Atlantic from their earlier base at Namao, Alta., to Italy *via* the Azores and Gibraltar. Equipment and spares to make the squadron independent of outside help are being flown over in the C-119s and by escorting North Stars of No. 426 Transport Sqn., Dorval. This is the first time that a Canadian Transport squadron has been based outside Canada in peace time.

A.M.D.G.W. Review

IT has for some time been Air Ministry policy to invite the assistance of committees, including outside members with experience of large-scale industrial concerns, to review aspects of Air Ministry and R.A.F. organization. A committee has now been appointed to review the organization of the Air Ministry Directorate-General of Works. Sir Philip Warter is chairman and the members are Air Chief Marshal Sir Walter Dawson, Sir Harold Parker and Sir Allan Quartermaine. The A.M.D.G.W. is responsible for the design, planning and supervision of all new works services for R.A.F. airfields and stations; its expenditure is at present running between £70m and £80m annually.

Changing Hands

THREE Naval vessels, the frigate *Crane* and the destroyers *Comus* and *Cheviot* are recommissioning at Mombasa ready to continue serving in the Far East without returning to England. The new ships' companies are being flown out to Mombasa in chartered aircraft.

Recruit Training School Closes

LAST week A.V-M. J. L. F. Fuller-Good, A.O.C. No. 22 Group, reviewed the last passing-out parade at No. 11 School of Recruit Training, Hednesford, Staffs. The School is now to be disbanded. Over 81,500 recruits have been trained there since 1950.

Sir Frederick Handley Page, at his company's apprentice prize-giving, looks to see who is next on the list; Mr. d'Erlanger has just handed a prize and diploma to J. Davies, who has completed his apprenticeship. (See first news item below.)

THE INDUSTRY

H.P. Apprentice Prizegiving

BEFORE a large audience at Mapesbury Hall, Willesden, on November 27, Mr. Gerard d'Erlanger (chairman of British Overseas Airways) presented prizes to Handley Page apprentices.

Mr. d'Erlanger, who was introduced by Sir Frederick Handley Page, recalled the parts which their respective organizations (in the case of B.O.A.C., its forerunner Imperial Airways) had played in early British civil aviation. He spoke with enthusiasm of the contribution made by the H.P.42 airliners of the 'thirties.

A presentation was made to Dr. J. E. Richardson, principal of the Northampton Engineering College, in recognition of the part he and his college have played in the training of apprentice engineers. He is leaving shortly to take up another post.

Heenan Group Progress

FOR the first time in its history the Heenan group, Ltd., has achieved a profit of over half a million. This is announced by Mr. Charles L. Hill, the chairman, in his statement circulated in advance of the annual general meeting.

Mr. Hill records that the group net profit, before taxation, for the past financial year is £505,900, compared with £449,485 for 1954-55. After deducting taxation of £282,369 against £232,449 and outside shareholders' minority interest of £22, the net profit is £223,509, compared with £217,009 in 1955.

Referring to the operating companies in the group, Mr. Hill reports that the engine test-plant section of Heenan and Froude, Ltd., Worcester, has made further progress in its development programme. In particular, the prototype of a new "stream lined" dynamometer has been built, which will eventually replace the existing range of smaller hydraulic dynamometers; and plant completed during the year has included "a helicopter engine test plant of unique design."

Fielding and Platt, Ltd., Gloucester, have improved their production during the year under review and "continue to receive valuable orders" for both the home and export markets. The special hydraulic plant ordered by the U.S.A. (referred to, said Mr. Hill, in his previous year's statement) has now been despatched.

New Digital Computer

RECENTLY demonstrated, for the first time in this country, was the Burroughs E.101 electronic digital computer. Designed as a medium-size machine to bridge the gap between small rotary calculators and very expensive, large-scale electronic computers, the E.101 is already in use with a number of American aircraft companies.

The Burroughs E.101 electronic digital computer.

The computer is particularly suitable for engineering and scientific applications. Fully automatic operation is provided by means of the programme pinboard, into which may be "pinned" the required sequences of instructions. In addition, the E.101 can be operated efficiently for semi-automatic processing, in which the operator assumes those functions which in certain problems can best be performed manually. This latter feature gives a flexibility not possessed by many large computers, as the operator can stop computation at a critical point and use his own judgment to determine which sequence of operations would be most efficient in solving the problem.

The basic price of the computer in the U.S.A. is about $35,000, optional extras such as punched tape input and output units and larger "memory" storage capacity increasing this price to about $45,000. Designed at the Burroughs Corporation, Inc., Research Center at Paoli, Pennsylvania, and produced at the company's Detroit plant, the E.101 is now being made available in Britain, and its construction by Burroughs Corporation, Ltd. (of 356 Oxford Street, London, W.1), in this country is under consideration.

American users of E.101 computers include Beech, Boeing, Cessna, McDonnell, United Aircraft, G.E.C., Massachusetts Institute of Technology and New York University. In a particular application at United Aircraft Corporation, an E.101 has been used to pilot the calculations of an I.B.M. Type 701 Electronic Data-Processing Machine in connection with engine design work at East Hartford.

IN BRIEF

Mr. E. K. Cole, chairman and managing director of E. K. Cole, Ltd., is visiting the U.S.A., Australia, New Zealand and India on a tour of Ekco interests and associates.

* * *

Mr. P. G. Lucas, G.M., F.R.Ae.S. (technical sales manager of the de Havilland Aircraft Co., Ltd.) and Mr. Henry F. Spencer have been appointed to the Board of the R.F.D. Co., Ltd. Mr. Spencer is managing director of Richard Thomas and Baldwin's, Ltd., and chairman of the South Wales Tinplate Corporation, Ltd.

* * *

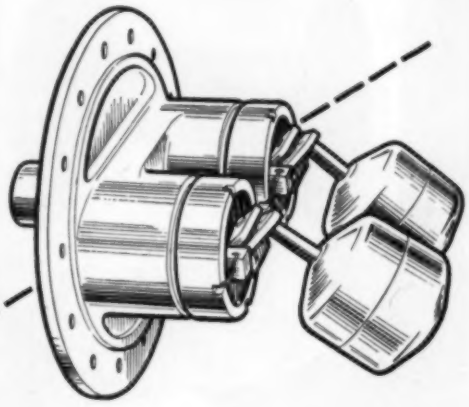
The Hymatic Engineering Co., Ltd., Redditch, Worcs., have appointed Mr. E. A. Hunt production controller and Mr. T. D. Lund senior production engineer. Mr. Hunt formerly held the same position with the industrial hydraulics division of the Lockheed Brake Co., Ltd., at Speke.

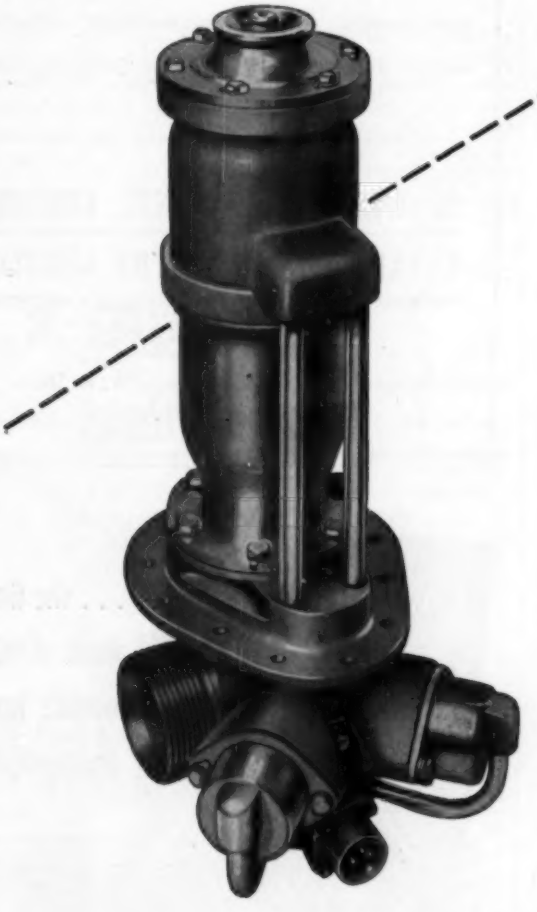
* * *

From Hellermann, Ltd., Tinsley Lane, Crawley, Sussex, comes information on Hellermann "P" clips for cables and pipe lines. Made of aluminium and covered with Helsyn, these clips are designed to provide protection from vibration and chafing and to be resistant to most hydraulic fluids, ethylene, glycol, paraffin, petrol, and high and low temperatures.

Mr. G. B. Jeffery, M.A., B.Sc., A.M.I.E.E., who has been appointed technical sales manager of the Kearfott division of R. B. Pullin and Co., Ltd., which is to manufacture synchros, servomotors and tachometer generators under a licensing agreement with the Kearfott Co., Inc. Mr. Jeffery joins the company from the Royal Aircraft Establishment, Farnborough, where for four-and-a-half years he was a senior engineer in the data transmission section of the electrical engineering department.

Double valves supply the answer





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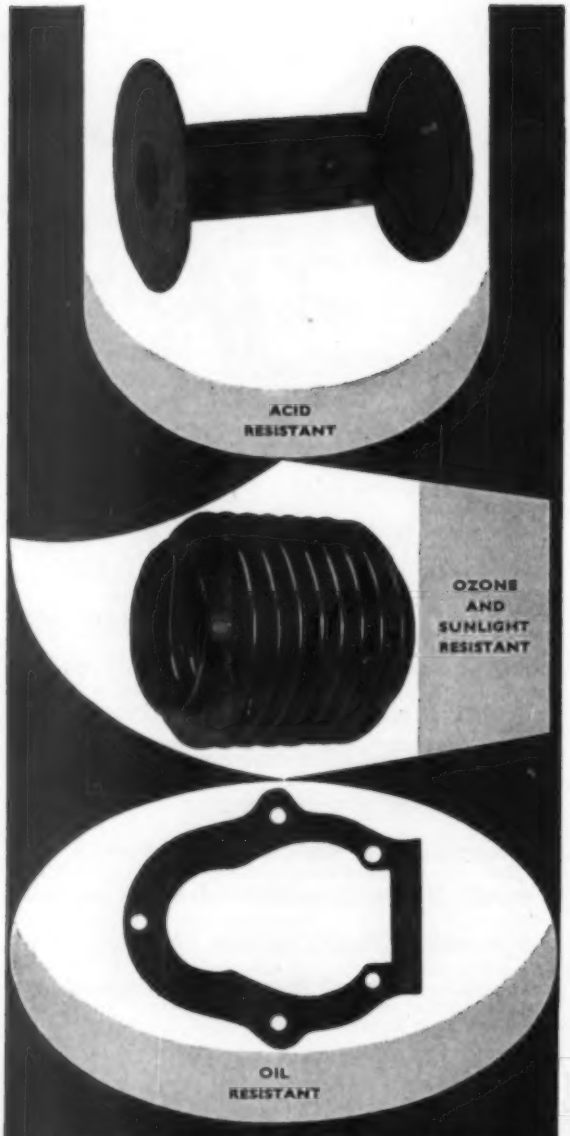

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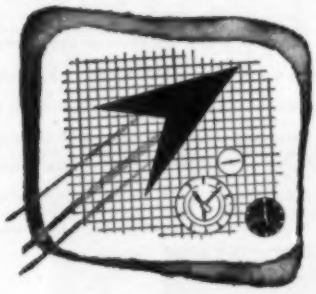

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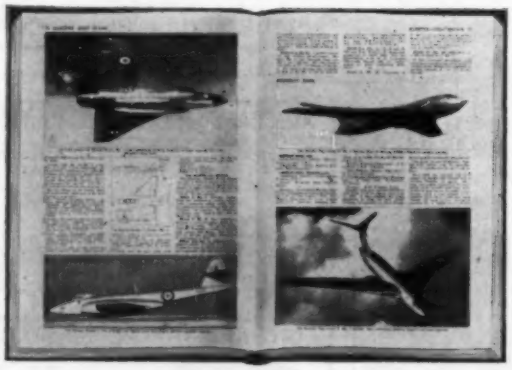

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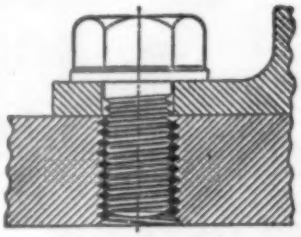

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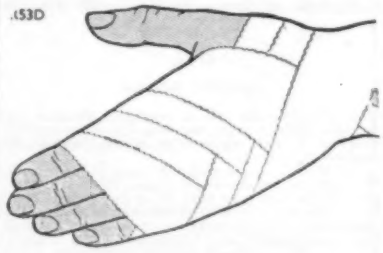

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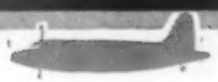

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THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned application to operate a scheduled air service:—

APPLICATION No. 125/4. From Central African Airways Corporation, of P.O. Box 1979, Salisbury, Southern Rhodesia, for an amendment to the terms of approval of their Colonial Coach Service which the Corporation have been authorised to operate between Salisbury (S. Rhodesia) and London until 31st March, 1957, so as to extend the period of operation from 1st April, 1957, to 31st March, 1958, and continue to operate the service at a frequency of six return flights per 28 days from April 1957 to March 1958 inclusive, with an additional two return flights each 28 days during the period April to October 1957 inclusive.

THIS application will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to this application must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [6032

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APPLICATION form and further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting S 128/56 and stating date of birth. Application forms should be returned by 31st December, 1956. [6029

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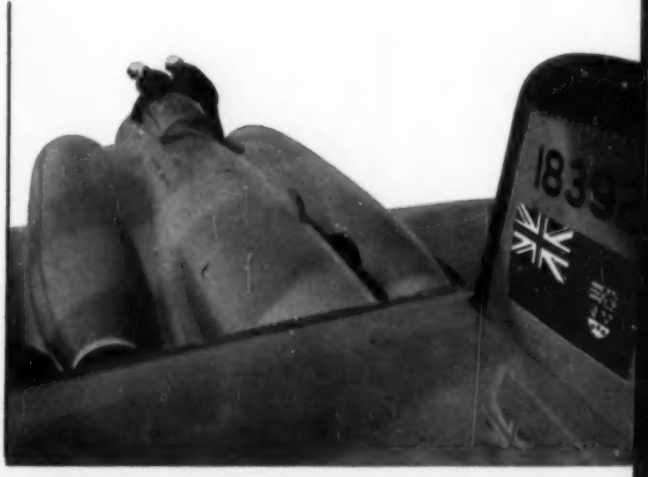

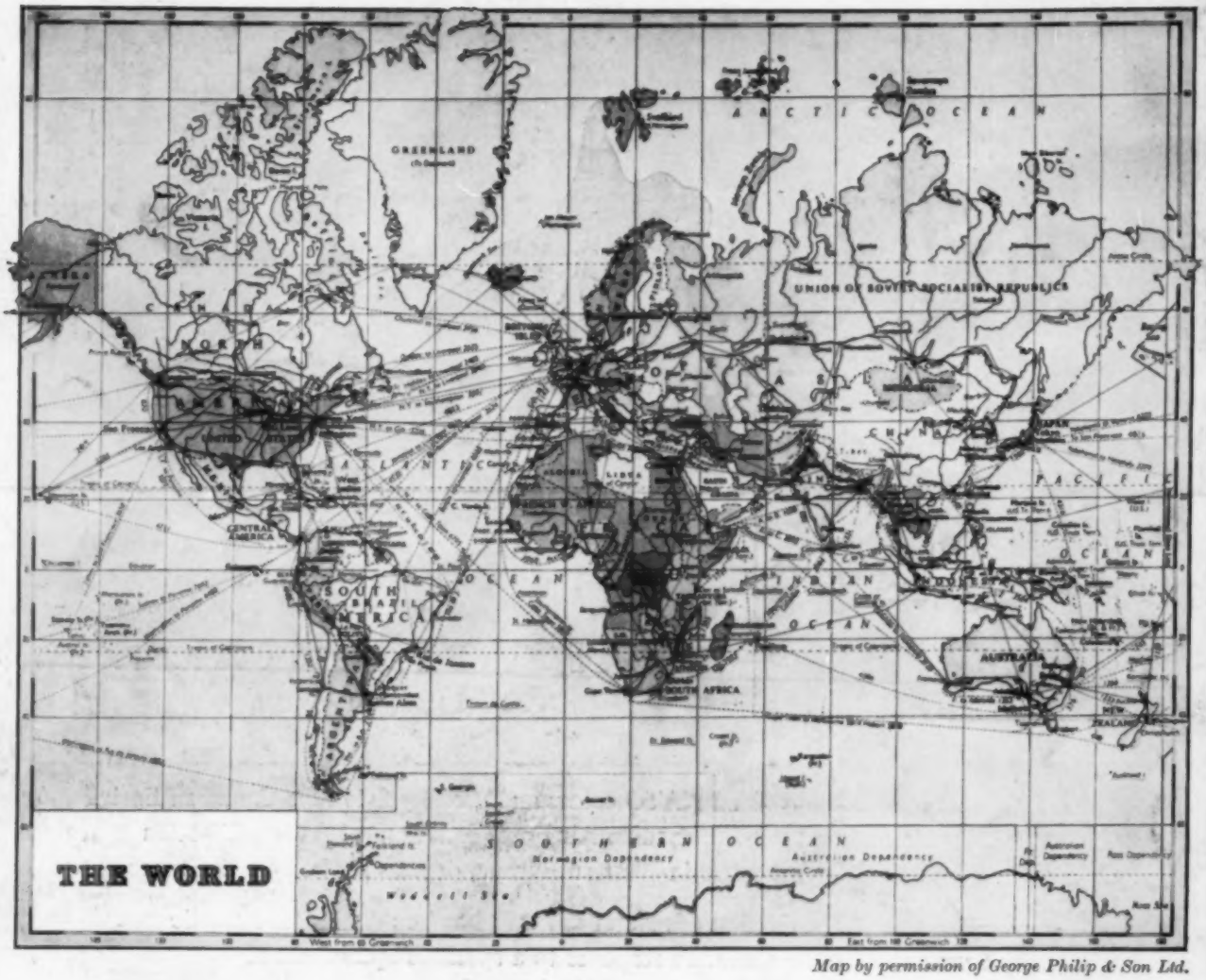

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